

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Overview

For full technical specifications, refer to AppleCare Tech Specs: <http://support.apple.com/specs/>



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Battery Safety Precautions

This computer contains a built-in lithium-polymer rechargeable battery pack that is serviceable by Apple-authorized service providers only. Tamper-resistant screws are employed to prevent users from attempting to remove the battery.

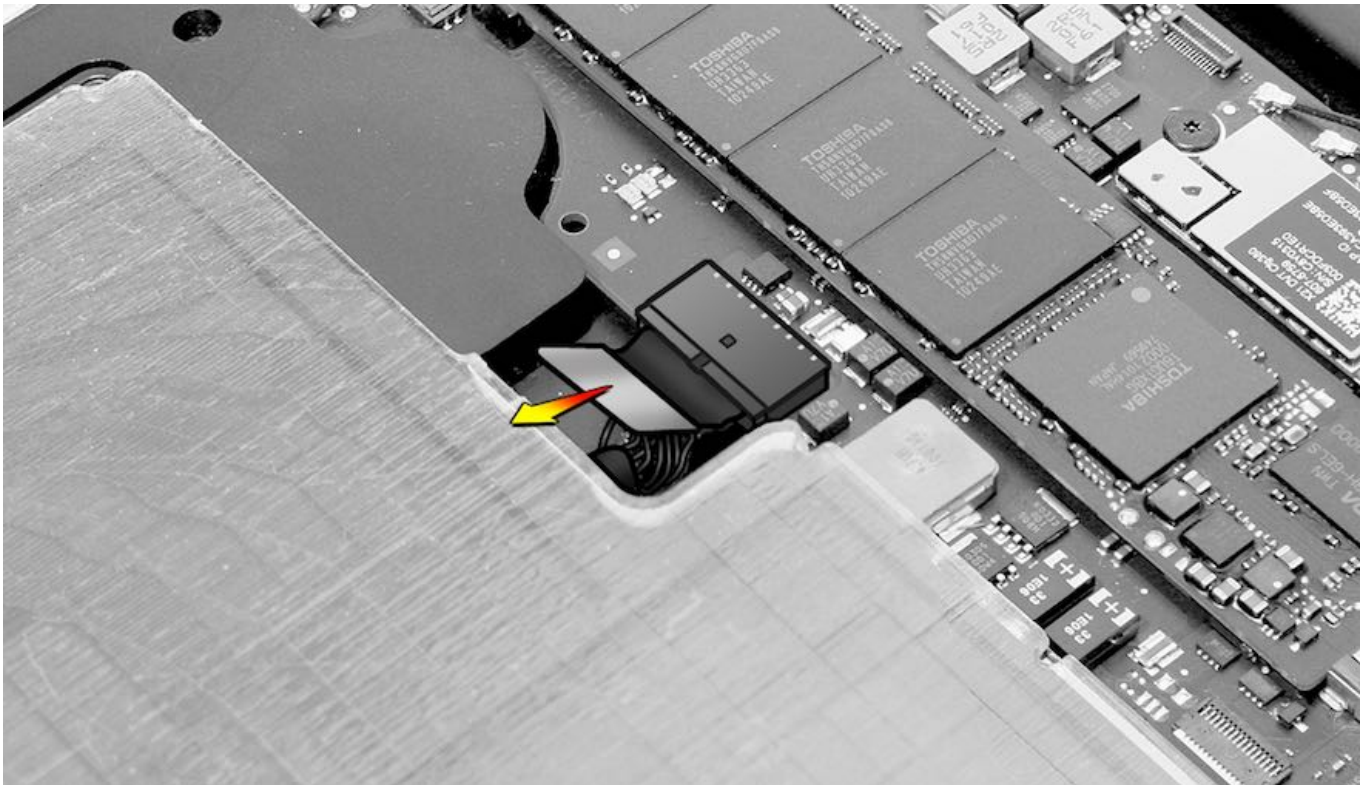


WARNING: Every time you remove the bottom case, attach the protective battery cover and disconnect the battery cable from the logic board.

WARNING:

- Batteries must be handled with utmost care.
- All work space must be free of foreign or sharp material and batteries should not be exposed to heat or open flame.
- Do not drop, stack, puncture, crush, flex or apply unnecessary pressure to a battery, as this may result in damage.
- Damage to a battery may result in a potential fire hazard.

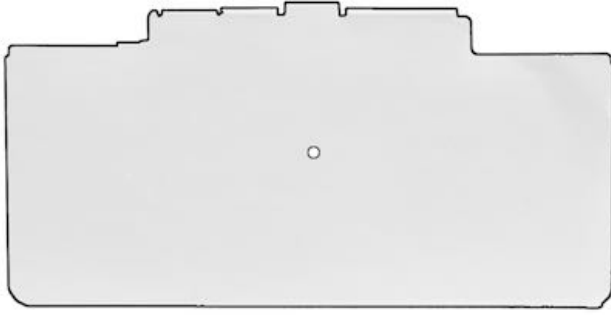
WARNING: Because the battery is internal and connected to the logic board by a cable, it **MUST BE DISCONNECTED** before performing service procedures. If you fail to do so, live current from the battery will short circuit the components and render the logic board and/or the EDP cable unusable.



Handling and Storage

Best Practices

The battery contains several soft battery cells. Do not press on the battery cells with your fingers, and do not handle the battery pack in any way that might apply any physical pressure to these cells.



- Always attach the appropriate battery cover to the battery immediately after removing the bottom case and before beginning battery removal or any other repair.
- Handle the covered battery by its edges only, with two hands at all times.
- Keep the battery cover on the battery at all times when the battery is out of the computer.
- Only remove the battery cover just before replacing the computer's bottom cover. Keep the battery cover on the battery at all other times.
- Do not drop a loose battery. If the battery is dropped, replace the battery.
- Only tighten the battery's screws finger tight; do not overtighten them by any amount, or irreparable damage to the battery pack can result.
- Do not twist or torque the battery, or irreparable damage to the battery can result.

Proper Sequence For Battery Removal

Battery removal steps are outlined below; detailed battery removal and replacement steps are described in the [Battery Take Apart](#) section.

Important: When servicing the MacBook Air (13-inch, Late 2010) or MacBook Air (11-inch, Late 2010) and later computers, make sure you have a battery cover for each model, as the batteries are different sizes. Ensure a cover is placed on each battery whenever the bottom case is removed or if the battery is out of unit.

1. Remove bottom case.
2. Attach battery cover to exposed side of battery while it is still installed inside the computer. Note: You can remove the cover by carefully pulling up on the tabs, located across the top of the battery cover.
3. Disconnect battery connector from logic board.
4. Remove battery screws.
5. Carefully lift out covered battery with both hands and place on a smooth, hard, clean surface free of screws and other debris. Or, place battery in the box that the known-good battery shipped in.

Proper Sequence For Battery Replacement

Caution: Make sure no screws are stuck under the battery (inside the top case) or stuck to the inside cover of the bottom case. Check both areas before inserting battery and replacing bottom case.

1. Ensure battery cover is properly attached to the soft side of the battery before installing into computer.
Note: The known-good battery should come with a cover already installed. Extra covers may be ordered in GSX.
2. Make sure top case interior is clean—free of any dust, dirt, loose screws, etc.
3. Carefully place known-good battery into position with both hands, aligning the screw holes in the battery frame with those of the computer's top case.
4. Install battery screws finger-tight; do not overtighten them by any amount or irreparable damage to the battery assembly can result.
5. Connect battery connector to logic board. Before replacing bottom case, remove battery cover and inspect battery for any dust, dirt, loose screws, etc.

Personal Protection

Use utmost care when handling the battery.

- Keep battery and computer away from heat and open flame. Store in a cool dry place.
- When servicing the computer, use the battery cover as directed.
- When handling a large container of batteries, steel-toed shoes are recommended.

WARNING: For complete training on battery safety and first-aid measures in case of accidental exposure, make sure you

read and understand this training article before servicing this computer: Apple Support article [OP24: Safely Handling Lithium Ion and Lithium Polymer Batteries](#).

Evaluating Battery Damage

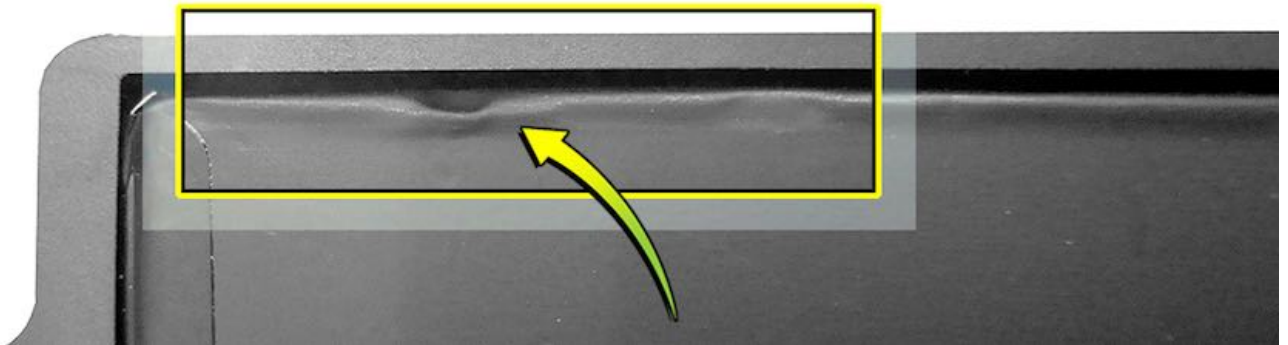
For more examples of cosmetic damage and complete directions on visual inspection, refer to Apple Support article [OP693: SERVICE: MacBook Air \(Late 2010 and later\), MacBook Pro with Retina display computers: Visual battery inspection](#).

Use battery if:

- Minor dents (up to 8 dents if 0.4 mm deep or less; up to 5 if 1.5 mm deep or less; up to 3 if 2.0 mm deep or less)

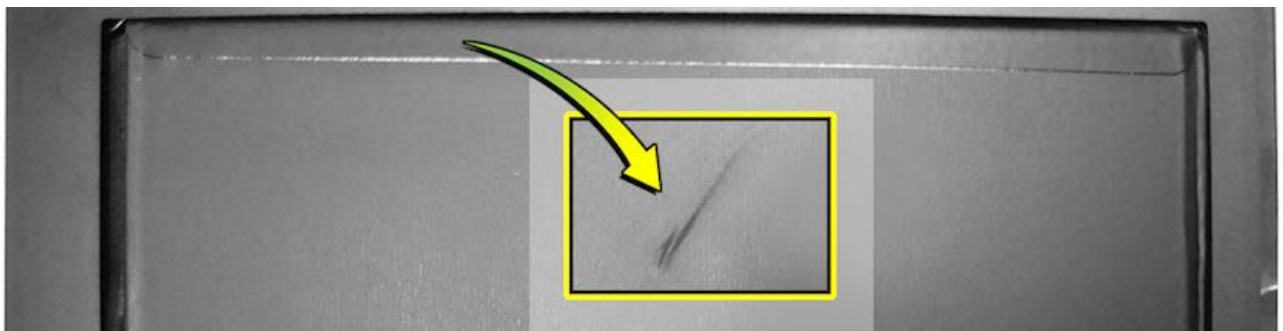


- Minor cell pack deformity (up to 2.0 mm total area)

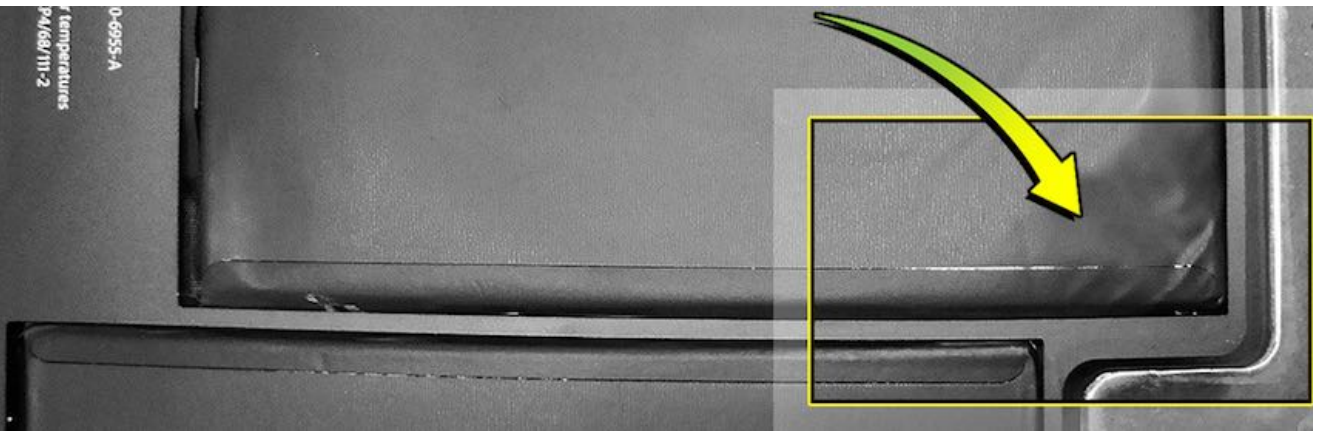


Return battery if:

- Scratches



- Swollen or wrinkled cell pack



Thunderbolt

Thunderbolt is a revolutionary I/O technology that supports high-resolution displays and high-performance data devices through a single compact port. It sets new standards for speed, flexibility, and simplicity. Read more at <http://www.apple.com/thunderbolt>.

Important: Thunderbolt requires up-to-date software and firmware to function properly. Obtain the latest updates via Software Update.

Caution: The Thunderbolt port is keyed for cable insertion in only one direction. Be sure to insert cables with the correct orientation. Do not use excessive force if the cable does not fit.

Portables: Keycap Replacement

Service packages of replacement keycaps are available for designated portable computers. The packages allow you to replace individual keycaps rather than the entire top case.

Keycap packages vary based on computer model, key color, and type of keyboard. For links to step-by-step instructions and package part numbers for specific models, refer to Apple Support article [OP120: Apple Portables: Keycap replacement matrix](#).

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Serial Number Locations

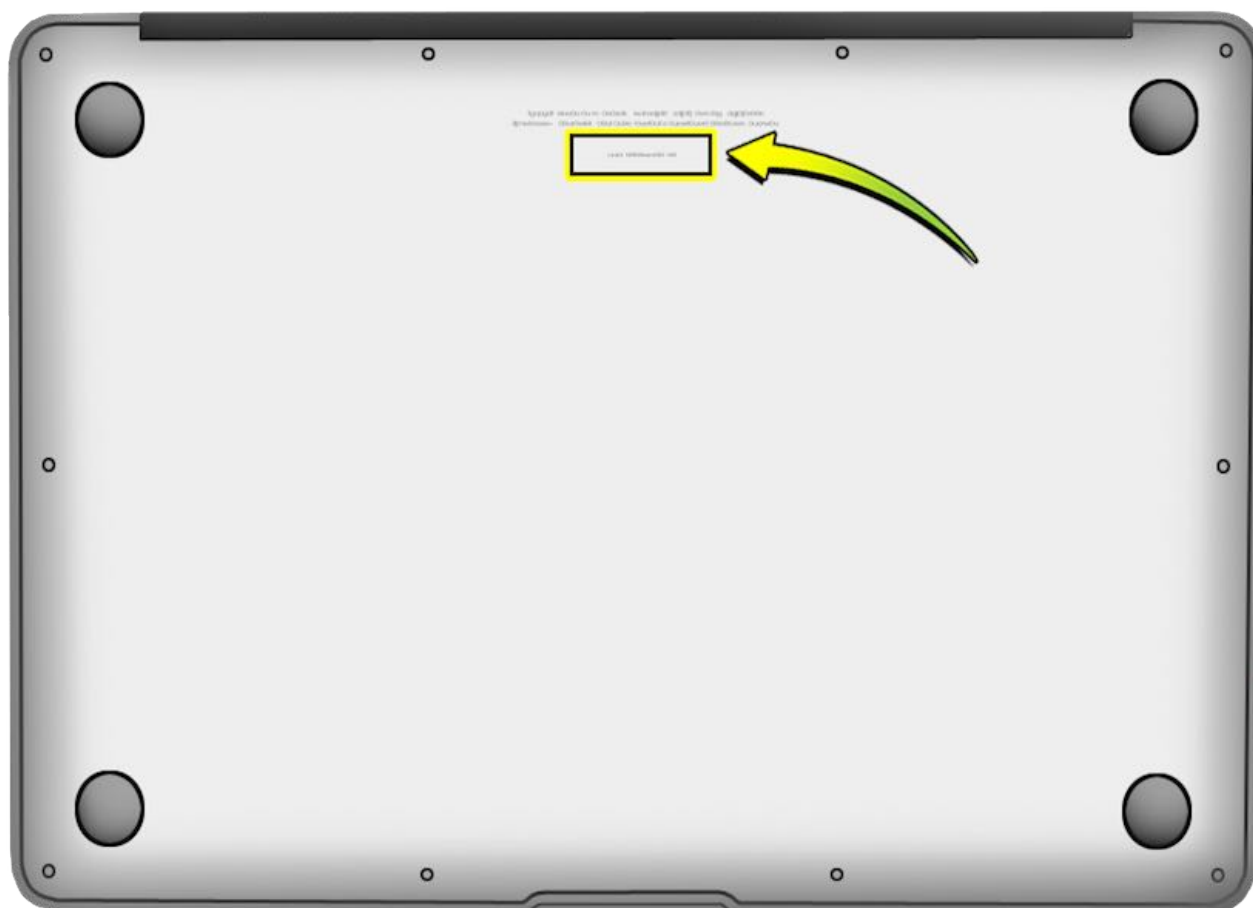
Serial Number Locations

Note: Barcode readers can be used to read serial numbers inside the computer.

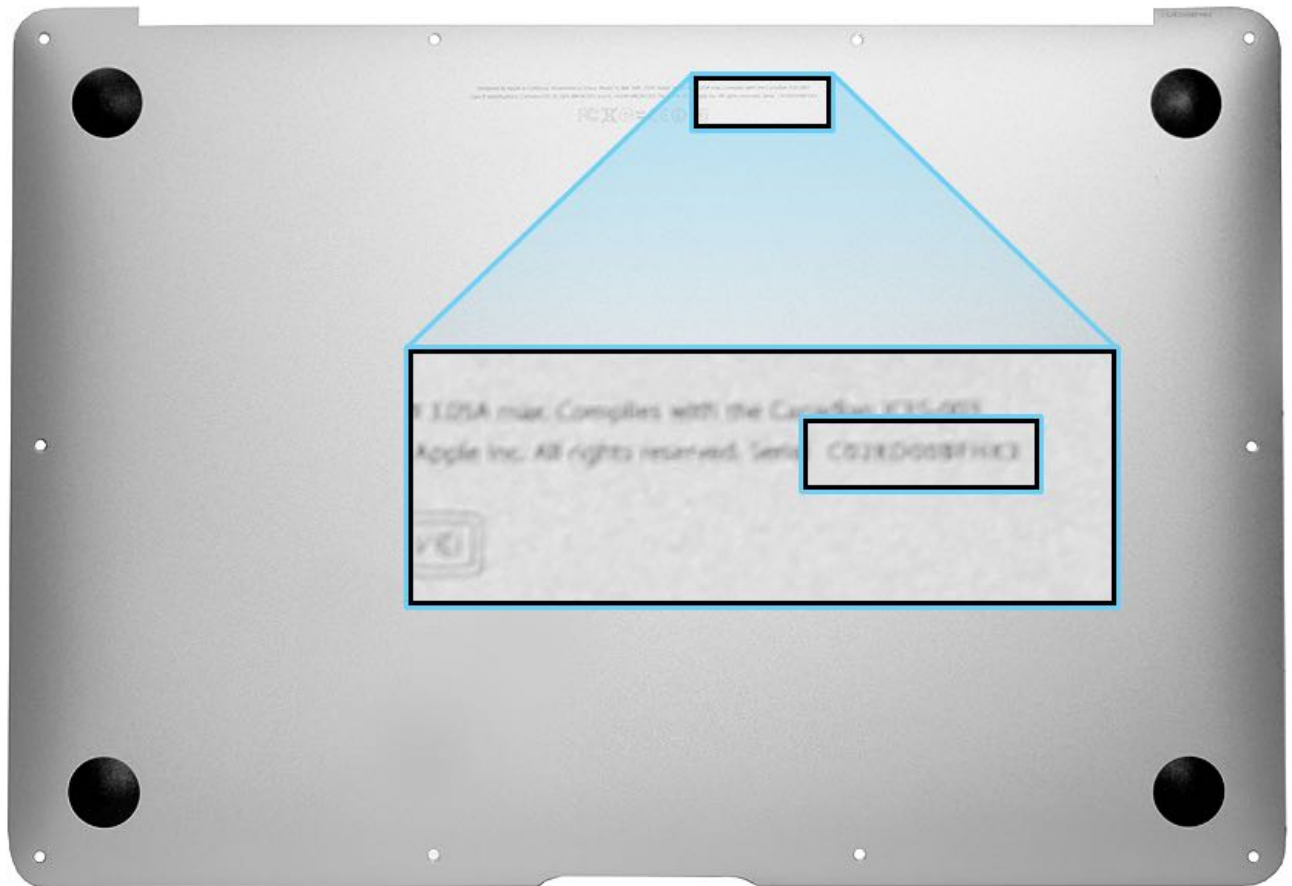
System Serial Number

Turn over computer to see serial number etched on bottom case near hinge.

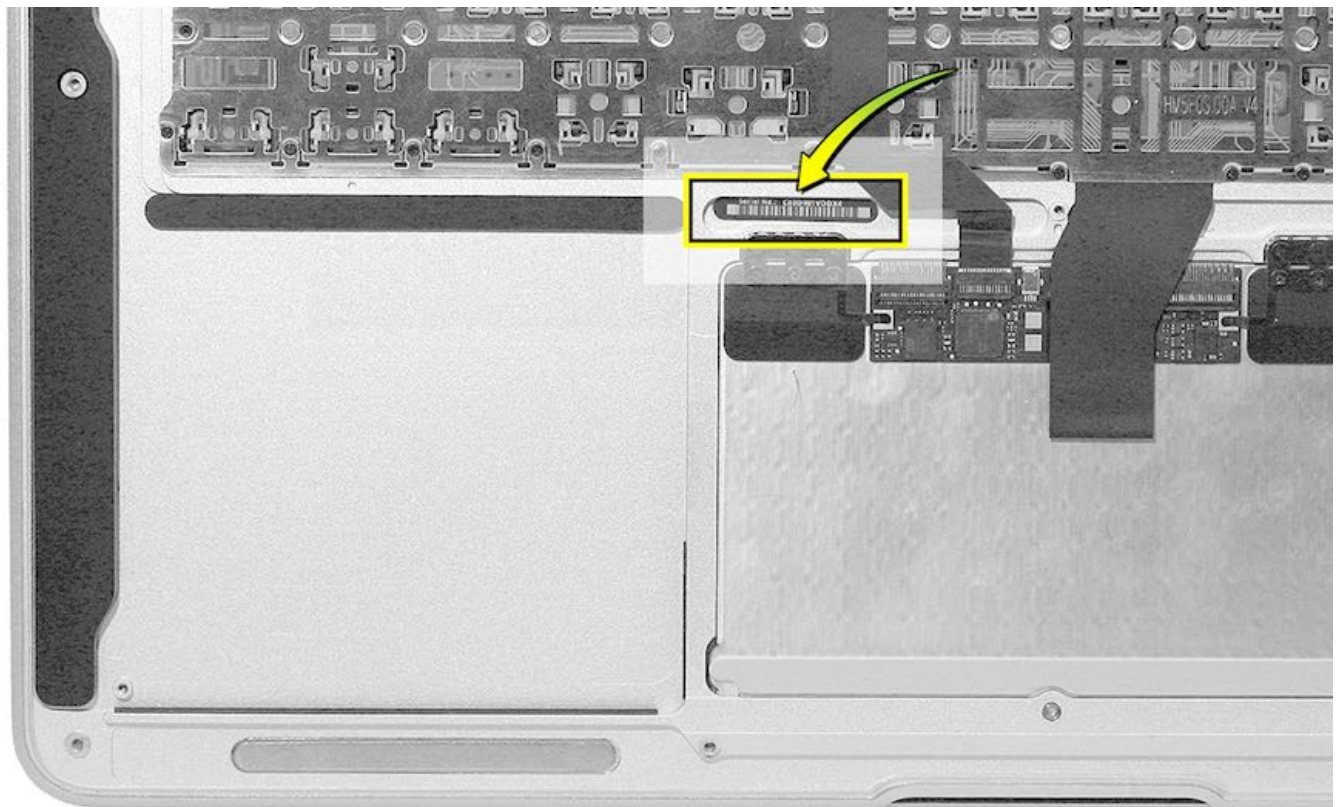
MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012)



MacBook Air (13-inch, Mid 2013, Early 2014)

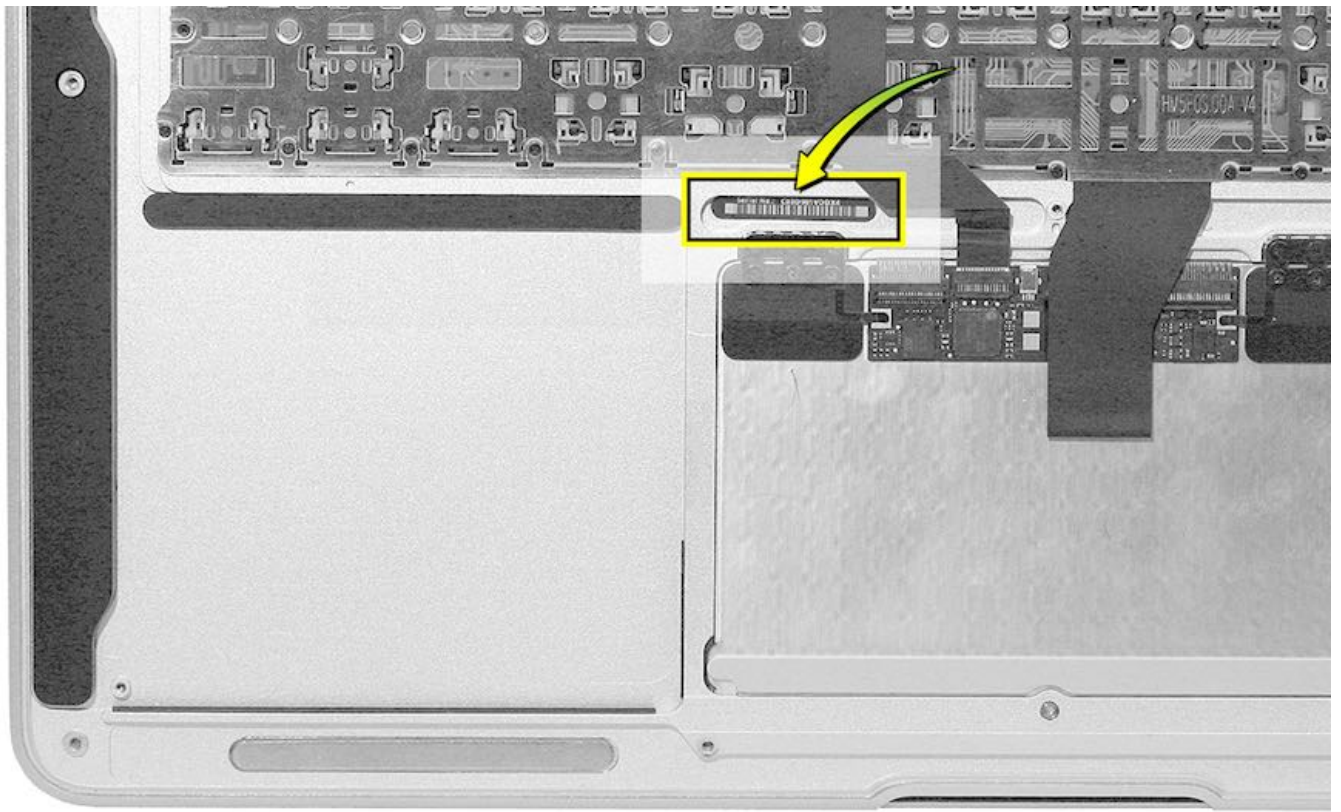


With battery removed, see system serial number label on top case.

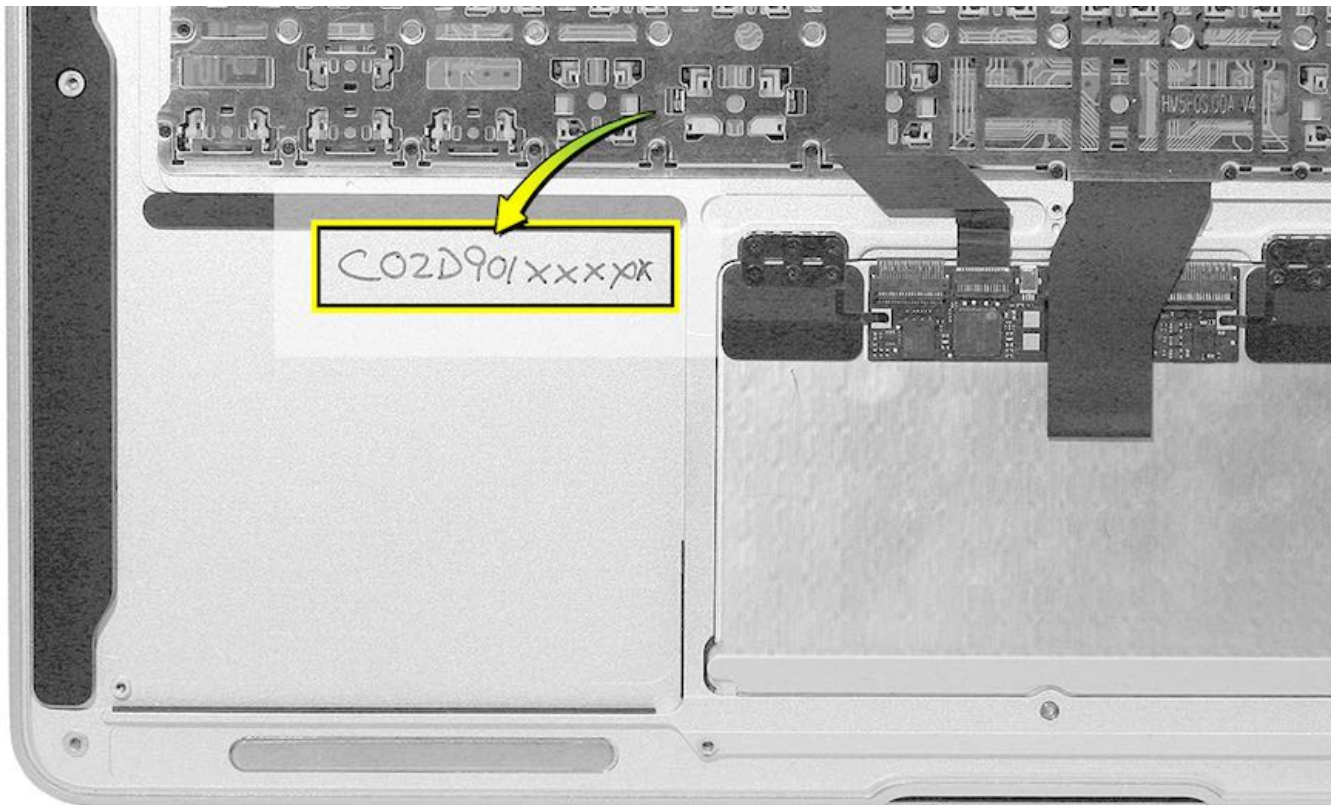


Transferring the System Serial Number

When replacing top case, retain user's top case until repair is complete. Before installing replacement, attach system serial number label in space above trackpad.

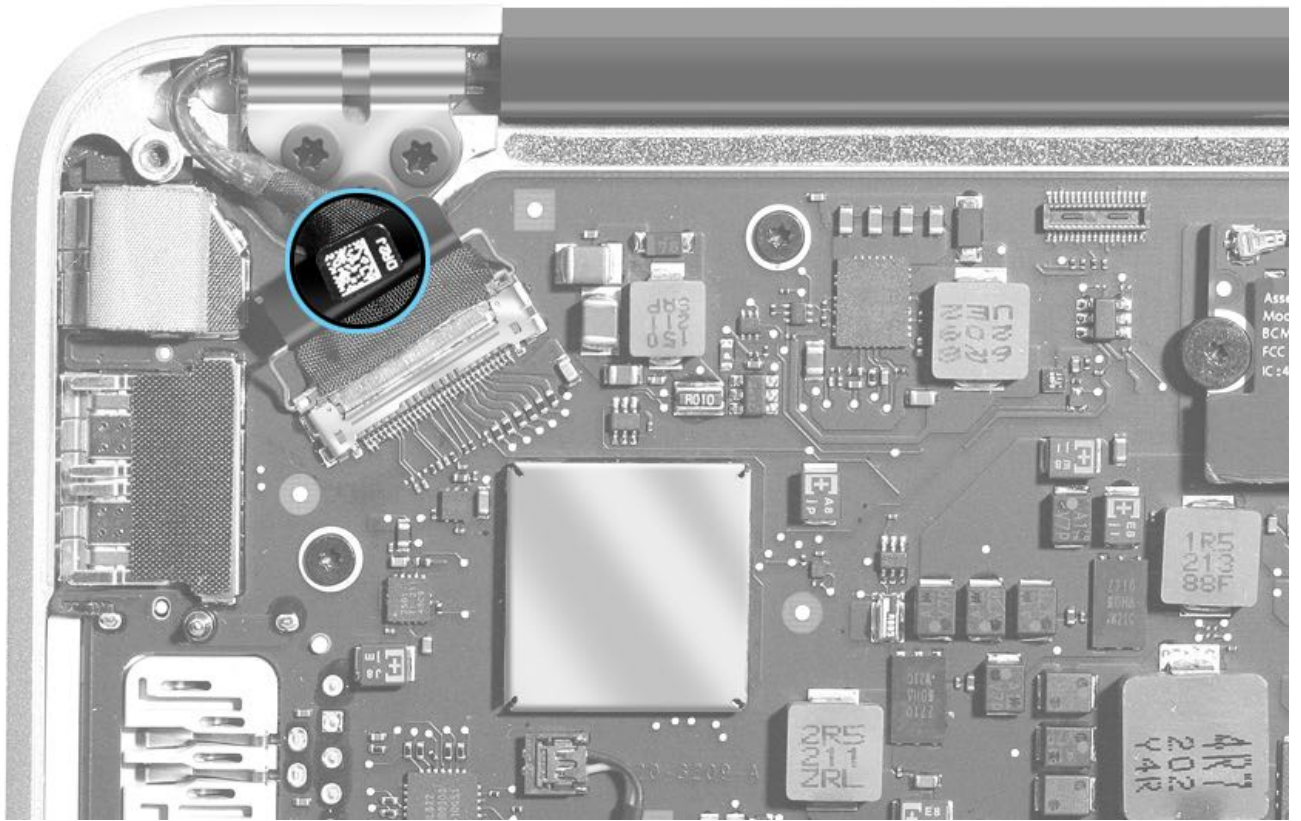


If serial number label cannot be reused, use a fine-tipped permanent marker to write serial number on inside of top case.



Display Clamshell Serial Number (Mid 2012, Mid 2013, Early 2014)

MacBook Air (13-inch, Mid 2012, Mid 2013, Early 2014) includes a 2D bar code of display clamshell serial number on underside of the pull tab for EDP cable. Bar code links display clamshell to system serial number.



General Troubleshooting

Update Software and Firmware

Important: Before you begin troubleshooting, ensure the correct version of OS X is installed, and check for and apply the latest software and firmware updates. Computers sometimes exhibit symptoms that indicate the wrong version of OS X system software is installed. Check Apple Support article [HT1159: Mac OS X versions \(builds\) for computers](#) to make sure system build is correct for this computer model.

Firmware is the name given to software that is written into memory circuits such as flash memory, that will hold the software code indefinitely, even when power is removed from the hardware. Firmware on Intel Mac computers is designed to be updated if necessary by running the OS X Software Update check (available in the Apple () menu) while computer is connected to the Internet.

For more information about firmware updates, refer to Apple Support articles:

- [HT1557: About firmware updates for Intel-based Macs](#)
- [HT1237: EFI and SMC firmware updates for Intel-based Macs](#)

Troubleshooting Theory

For more information about troubleshooting theory, go to [AppleCare Service Training](#) > Courses > Technician > Troubleshooting, and choose [Troubleshooting Theory](#) from the course list.

Hardware vs. Software

To isolate a hardware issue from a software issue, refer to Apple Support article [TS1388: Isolating issues in Mac OS X](#).

To troubleshoot a software issue, refer to the following Apple Support articles:

Mac OS X v10.6 and later

- [HT3258: OS X: About the incompatible software folder](#)

Mac OS X v10.6 and earlier

- [TS1394: Troubleshooting Mac OS X installation and software updates \(Mac OS X v10.6 and earlier\)](#)
- [HT1199: Mac OS X: How to troubleshoot a software issue](#)
- [HT2186: Don't install a version of Mac OS X earlier than what came with your Mac](#)
- [HT2956: Troubleshooting Mac OS X installation from CD or DVD](#)

Quick Check Procedures

Resetting the System Management Controller (SMC)

The System Management Controller (SMC) is a chip on the logic board that controls all power functions. If the computer is experiencing any power issue, such as not starting up, not displaying video, sleep issues, or fan noise issues, resetting SMC may resolve it.

For more information and instructions to reset the SMC on different computer models, refer to Apple Support article [HT3964: Intel-based Macs: Resetting the System Management Controller \(SMC\)](#).

Note for iMacs: If you press the power button while inserting the power cord, the iMac will enter a mode in which the fans run at full speed. For more information, refer to Apple Support article [TS1433: iMac: Fans run at full speed after computer turns on](#).

Resetting Parameter RAM (PRAM)

PRAM stores certain system and device settings in a location that OS X can access quickly. Exactly which settings are stored in the computer's PRAM varies depending on the type of computer as well as the types of devices and drives connected. To reset PRAM:

1. Shut down the computer.
2. Locate the following keys on the keyboard: Command, Option (Alt), P, and R. You will need to hold these keys down simultaneously in Step 4.
3. Press power button.
4. Immediately press and hold Command-Option-P-R keys.
Important: You must press this key combination before the gray screen appears.
5. Hold down keys until computer restarts, and you hear startup chime a second time.
6. Release keys.

For more information, refer to the following Apple Support articles:

- [HT1242: Mac OS X: What's stored in PRAM](#)
- [HT1379: Resetting your Mac's PRAM and NVRAM](#)

Starting Up in Safe Mode

Safe Mode is the state into which you can start up your Mac by performing a Safe Boot. Starting up into Safe Mode does several things that can help troubleshoot and resolve software or directory issues that may exist on the startup volume. To start up in Safe Mode:

1. Make sure computer is shut down.
2. Press power button.
3. Immediately after you hear startup sound, press and hold Shift key.
Note: The Shift key should be held as soon as possible after startup sound but not before.
4. Release Shift key when you see the screen with a gray Apple and progress indicator (looks like a spinning gear). Note that booting into Safe Mode will take longer than a normal startup. During startup in OS X v10.4 through OS X v10.6.8, you will see "Safe Boot" on the login window, which appears even if you normally log in automatically. In OS X v10.6 and later, a gray progress bar is also displayed on the bottom of the window during Safe Boot. During startup in OS X v10.2 through v10.3.9, you will see "Safe Boot" on the OS X startup screen.
5. To leave Safe Mode, restart computer normally, without holding down any keys during startup.

For more information, refer to the following Apple Support articles:

- [HT1564: Mac OS X: What is Safe Boot, Safe Mode?](#)
- [HT1455: Mac OS X: Starting up in Safe Mode](#)
- [TS1884: Safe Boot takes longer than normal startup](#)

MacBook Air (Late 2010 and later) and MacBook Pro (Retina, Mid 2012 and later): Sleep Status Tips

This computer model does not have a sleep LED. To troubleshoot without one:

- Connect a USB device that has a power-on or activity LED. As power is restored to the USB bus and the system wakes from sleep, the LED lights up.
- Press Caps Lock key multiple times to wake computer from sleep.
- Open display and press an alphanumeric key to wake computer from sleep.
- A computer that has been asleep for an extended period can consume the remaining charge of the battery. Restore power to computer with known-good power adapter, and check that MagSafe indicator light shows an in-progress battery charge. The computer will boot from a hibernation file and start up from where it left off.
- Resetting SMC instantly shuts down computer, with some side effects:
 - If computer is in sleep mode, it will reboot from a hibernation file.
 - If computer is booted to OS X during the SMC reset, data from open applications can be lost.
 - If computer is already shut down, there will be no side effects.

Note: Look for MagSafe indicator light to momentarily switch from off to green as SMC is reset and re-establishes communication with power adapter; then change from green to orange if battery needs a charge.

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Diagnostic Software

	Apple Service Diagnostic (ASD)	Apple Hardware Test (AHT)	Apple Diagnostics
MacBook Air (13-inch, Late 2010)	3S142	3A204	
MacBook Air (13-inch, Mid 2011)	3S146	3A223	
MacBook Air (13-inch, Mid 2012)	3S155	3A244	
MacBook Air (13-inch, Mid 2013)	3S156		v1.0 or later
MacBook Air (13-inch, Early 2014)	3S156		v1.0.6 or later

Apple Service Toolkit (AST)

AST is a suite of diagnostic tools that checks Intel-based Mac hardware components, and provides detailed diagnostic logs for review. AST runs on a local server, managing multiple Ethernet clients via NetBoot.

For more information, refer to Apple Support articles:

- [OP476: Latest Apple Service Toolkit download links and documentation](#)
- [TP586: AST Reference Guide](#)

Mac Resource Inspector (MRI)

MRI, which is part of AST, is a quick triage tool that checks for the presence of hardware and reports sensor readings. Sensors are located on a variety of parts, including cables, fans, storage devices, power supply, display panel, and logic board. Use MRI to help isolate failures and avoid unnecessary part replacements. MRI complements ASD, which is a more in-depth repair verification tool.

Note: If all AST checks pass and a component is still suspected of fault, then verify with other diagnostic tools.

Cooling System Diagnostic (CSD)

CSD evaluates thermal sensors, fans, and heat sinks in late model MacBook Pro, MacBook Air, and iMac computers. It either confirms correct operation or helps diagnose service issues. CSD is useful when assisting users with questions about fan noise. This 30-40 minute test, designed for use at the repair bench, fully checks thermal efficiencies in MacBook Air (13-inch, Late 2010) and later models. This test requires a USB ambient temperature sensor, available for order via GSX (part number 922 - 9911).

Trackpad Keyboard Mapper

The Trackpad Keyboard Mapper pairs the trackpad and keyboard of MacBook Air (Mid 2013 and Early 2014) models. To ensure correct keyboard behavior, you must run this tool whenever you replace a Mid 2013 or Early 2014 trackpad. For more information, refer to [TP1016: AST Reference Guide: Using the Trackpad Keyboard Mapper](#).

MacBook Air (13-inch, Late 2010): Thermal and Electrical Sensors

MacBook Air (13-inch, Late 2010) Thermal Sensors

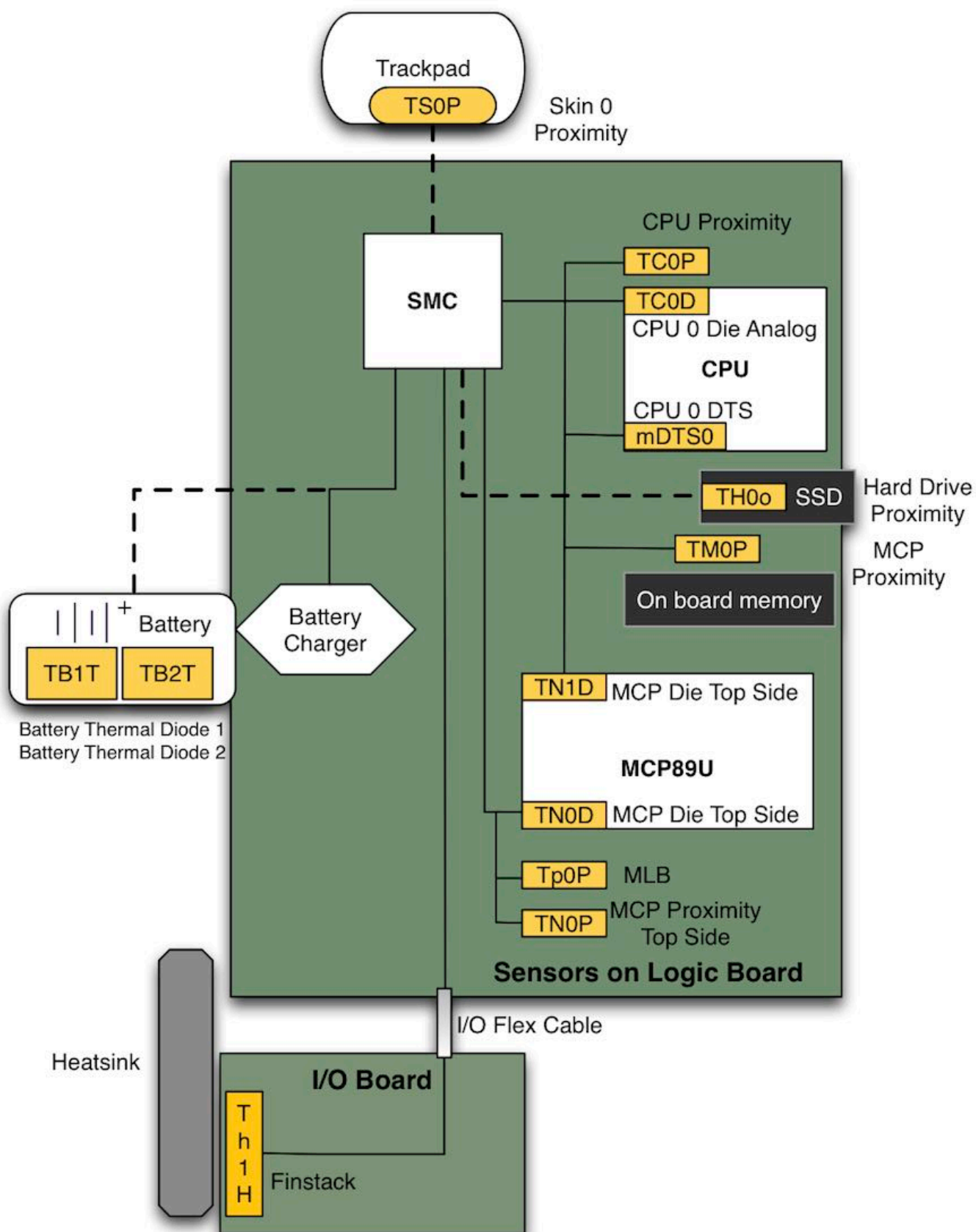
SMC Name	Location	General Description	MRI/ASD Name
TC0D	Logic board	CPU 0 Die	CPU 0 Die Analog
TC0P	Logic board	CPU 0 Proximity	CPU Proximity
mDTS0	Logic board	CPU Int Die	CPU 0 DTS
TN0D	Logic board	MCP 0 Die	MCP Die Top Side
TN1D	Logic board	MCP Int Die	MCP Die Top Side
TM0P	Logic board	SSD & RAM Proximity	MCP Proximity
Tp0P	Logic board	MLB Thermal	MLB
TN0P	Logic board	MCP 0 Proximity	MCP Proximity Top Side
Th1H	I/O board	Heat Sink Proximity	Fin Stack
Ts0P	Trackpad	Trackpad/Palmrest Thermal	Skin 0 Proximity
TB1T	Battery	Battery Thermal Diode 1	Battery Thermal Diode 1
TB2T	Battery	Battery Thermal Diode 2	Battery Thermal Diode 2
TH0o	SSD card	Hard Disk out-of-band	Hard Drive Proximity

MacBook Air (13-inch, Late 2010) Electrical Sensors

Electrical Sensor	Location	General Description	MRI/ASD Name
VC0C	Logic board	CPU Vcore (Voltage)	CPU 0 Core
VN0C	Logic board	MCP Vcoe (Voltage)	MCP Core 0
VP0R *	Logic board	PBUS (Voltage)	PBus
PC0C	Logic board	CPU Vcore (Power)	CPU 0 VCore Loadside
ID0R *	Logic board	DC-IN(AMON) (Current)	DC In
IB0R	Logic board	Battery(BMON) (Current)	Battery
IN0C	Logic board	MCP Vcore (Current)	MCP 0 Core
IN1C	Logic board	MCP memory (Current)	MCP 1 Memory
1C0R	Logic board	CPUVcore_VTT (Current)	Sensor Rail 0

* If power adapter is not connected, electrical sensors VP0R and ID0R will fail AHT testing. Always connect a powered AC adapter when using AHT. For more information, refer to Apple Support article [TS3578: MacBook Air \(Late 2010\): Apple Hardware Test reports SNS message when the power adapter is not connected.](#)

The following map shows the general location of the thermal sensors (highlighted in gold) and their associated part within the computer housing.



MacBook Air (13-inch, Mid 2011): Thermal and Electrical Sensors

MacBook Air (13-inch, Mid 2011) Thermal Sensors

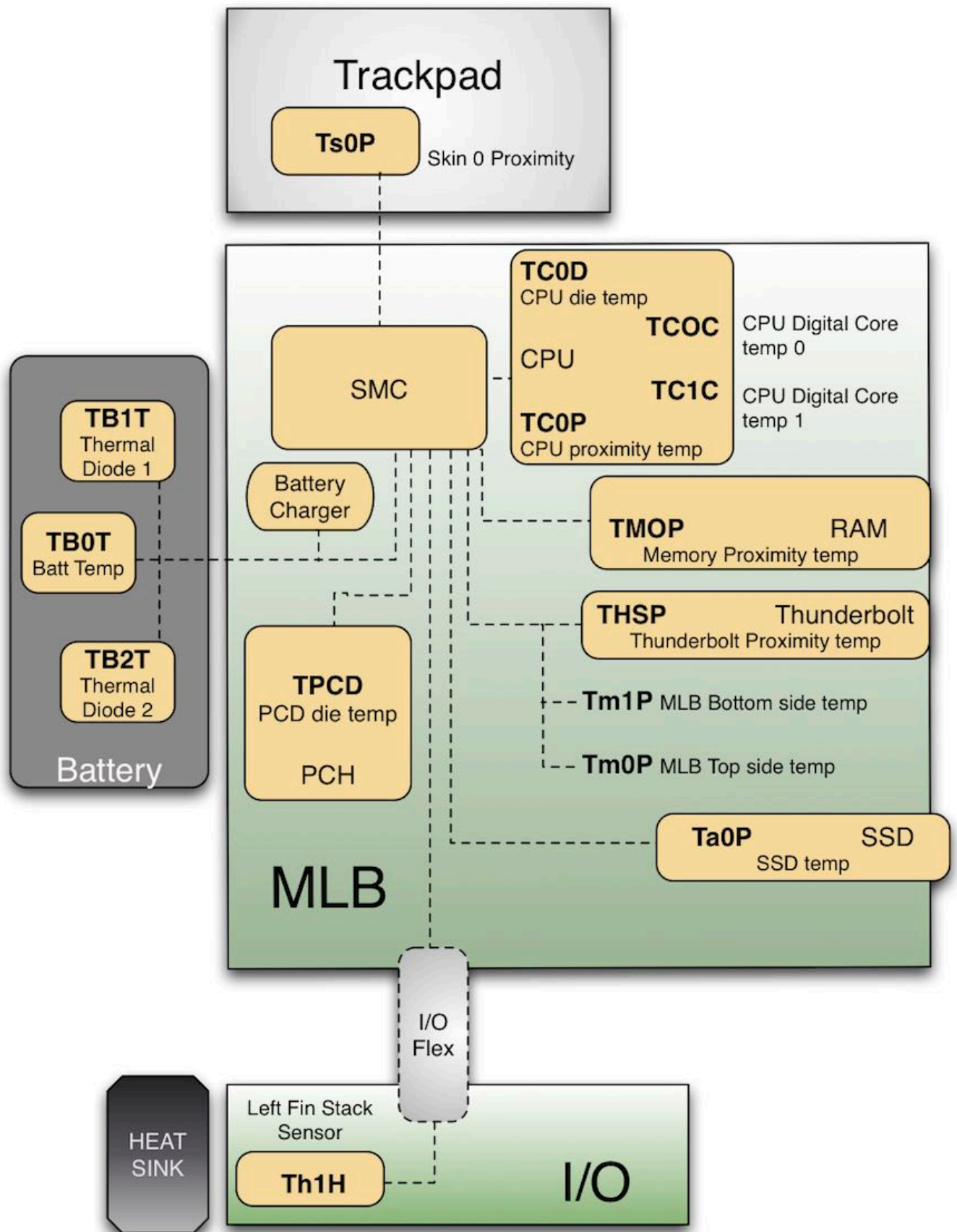
SMC Name	Location	General Description	MRI/ASD Name
TPCD	Logic board	PCH Die Temperature	PCH
TC0D	Logic board	CPU Die Temperature	CPU 0 Die Analog
TC0P	Logic board	CPU Proximity Temp	CPU Proximity Temp
TM0P	Logic board	Memory Proximity Temp	Inlet
Ta0P	Logic board	SSD Temperature	Inlet
Tm1P	Logic board	MLB Bottomside Temp	Inlet
Tm0P	Logic board	MLB Topside Temp	DC-in Proximity Airflow
THSP	Logic board	Thunderbolt Proximity Temp	Thunderbolt Proximity
TC0C	Logic board	CPU Die Core Temp 0	CPU Die Digital Core 0
TC1C	Logic board	CPU Die Core Temp 1	CPU Die Digital Core 1
Th1H	I/O board	Left Fin Stack Sensor	Fin Stack
Ts0P	Trackpad	Skin 0 Proximity	Skin 0 Proximity
TB1T	Battery	Battery Thermal Diode 1	Battery Thermal Diode 1
TB2T	Battery	Battery Thermal Diode 2	Battery Thermal Diode 2
TB0T	Battery	Battery Temperature	Battery Temperature

MacBook Air (13-inch, Mid 2011) Electrical Sensors

Electrical Sensor	Location	General Description	MRI/ASD Name
VC0C	Logic board	CPU Vcore (Voltage)	CPU VCore
VN0C	Logic board	PCH Vcore (Voltage)	AXG VCore
VP0R *	Logic board	PBUS (Voltage)	PBus
VD0R	Logic board	DC-in (Voltage)	DC-in Rail 0
ID0R	Logic board	DC-IN(AMON) (Current)	DC In
IB0R	Logic board	Battery(BMON) (Current)	Battery
1C0R	Logic board	CPUVcore_VTT (Current)	Sensor Rail 0

* If power adapter is not connected, electrical sensors VP0R and ID0R will fail AHT testing. Always connect a powered AC adapter when using AHT. For more information, refer to Apple Support article [TS3578: MacBook Air \(Late 2010\): Apple Hardware Test reports SNS message when the power adapter is not connected](#).

The following map shows the general location of the thermal sensors (highlighted in gold) and their associated part within the computer housing.



Portables: Temperature Concerns

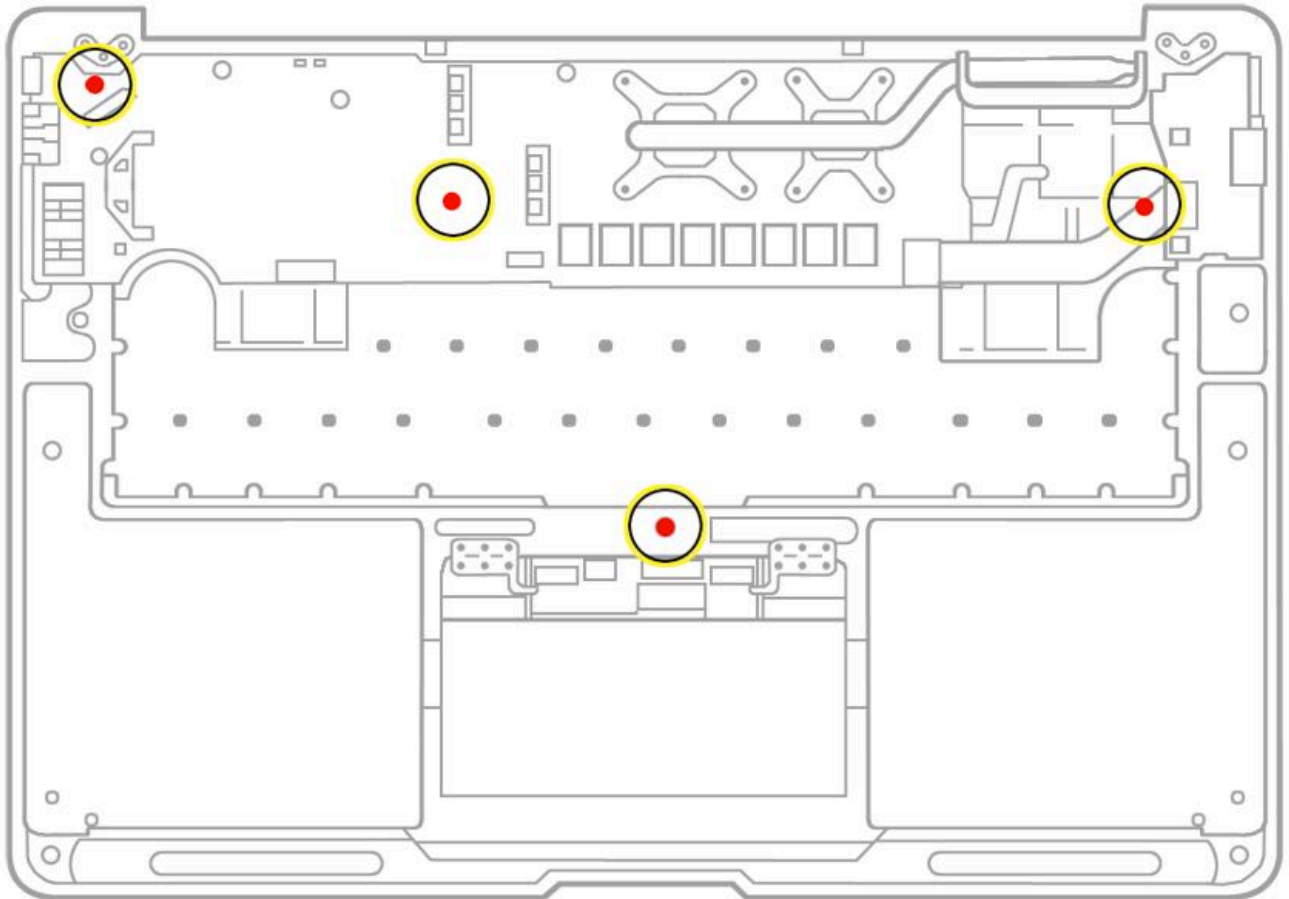
The normal operating temperature of this computer is well within national and international safety standards. Nevertheless, users may be concerned about generated heat. To prevent an unneeded repair, you can compare a user's computer to a similar running model, if available at your repair site. For more information, refer to Apple Support article [HT1778: Mac notebooks: Operating temperature](#).

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Liquid Contact Indicators

To help discover accidental damage to the computer, the top case includes spill sensors called liquid contact indicators (LCI). The sensors are visible only when the bottom case and most of the modules have been removed. Normally represented by small white dots, the LCIs turn red when they have come in contact with liquid, such as an accidental spill.

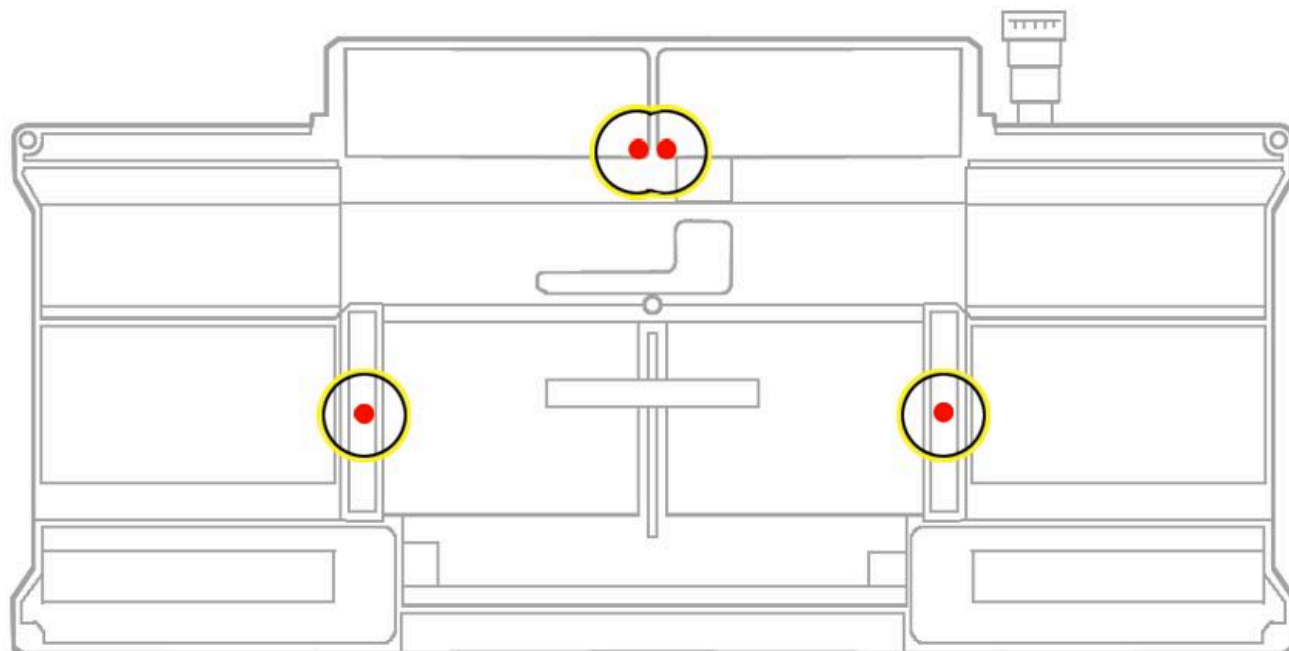
For more information, refer to Apple Support article [HT3400: Mac computers: About liquid contact indicators \(LCIs\) and warranty coverage](#)

The following image shows the general location of the LCIs in this computer. For LCIs that are not readily visible with the bottom case removed, check the same area under cables or on the other side of modules.



Battery Liquid Contact Indicators

This image shows the location of LCIs on the underside of the battery module.



LCD Pixel Anomalies

When displaying a single color over the screen area, the LCD panel might show one or more pixels that are not properly lit.

LCD technology uses rows and columns of addressable points (pixels) that render text and images on the screen. Each pixel has three separate subpixels—red, green and blue—that allow an image to render in full color. Each subpixel has a corresponding transistor responsible for turning that subpixel on and off.

Depending on the display size, there can be thousands or millions of subpixels on the LCD panel. For example, the LCD panel used in the iMac (27-inch, Late 2012) has a display resolution of 2560 x 1440, which means there are 3.7 million pixels. Each pixel is made up of a red, a green, and a blue subpixel, resulting in over 11 million individual picture elements on the 27-inch display. Occasionally, a transistor may not work perfectly, which results in the affected subpixel remaining off (dark) or on (bright). With the millions of subpixels on a display, it is possible to have a low number of such transistors on an LCD. In some cases a small piece of dust or other foreign material may appear to be a pixel anomaly. Apple strives to use the highest quality LCD panels in its products, however pixel anomalies can occur in a small percentage of panels.

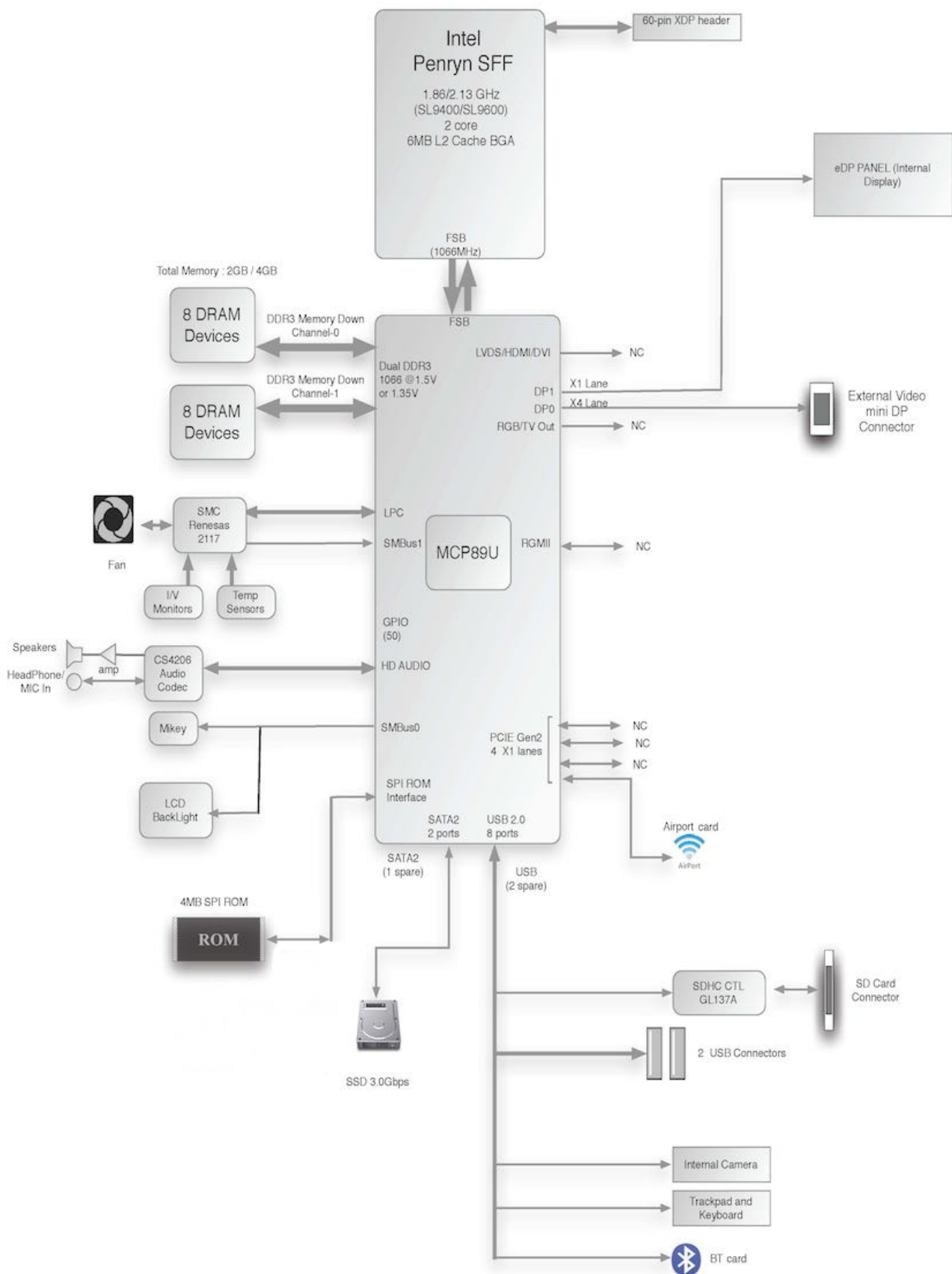
In many cases pixel anomalies are caused by a piece of foreign material that is trapped somewhere in the display or on the front surface of the glass panel. Foreign material is typically irregular in shape and is usually most noticeable when viewed against a white background. Foreign material that is on the front surface of the glass panel can be easily removed using a lint free cloth. Foreign material that is trapped within the screen must be removed by an Apple Authorized Service Provider or Apple Retail Store.

To determine if the display has an acceptable number of pixel anomalies, see the appropriate Apple Support article:

- [HT4044: About LCD display pixel anomalies for Apple products released in 2010 and later](#)
- [HT1721: About LCD display pixel anomalies for Apple products released before 2010](#)

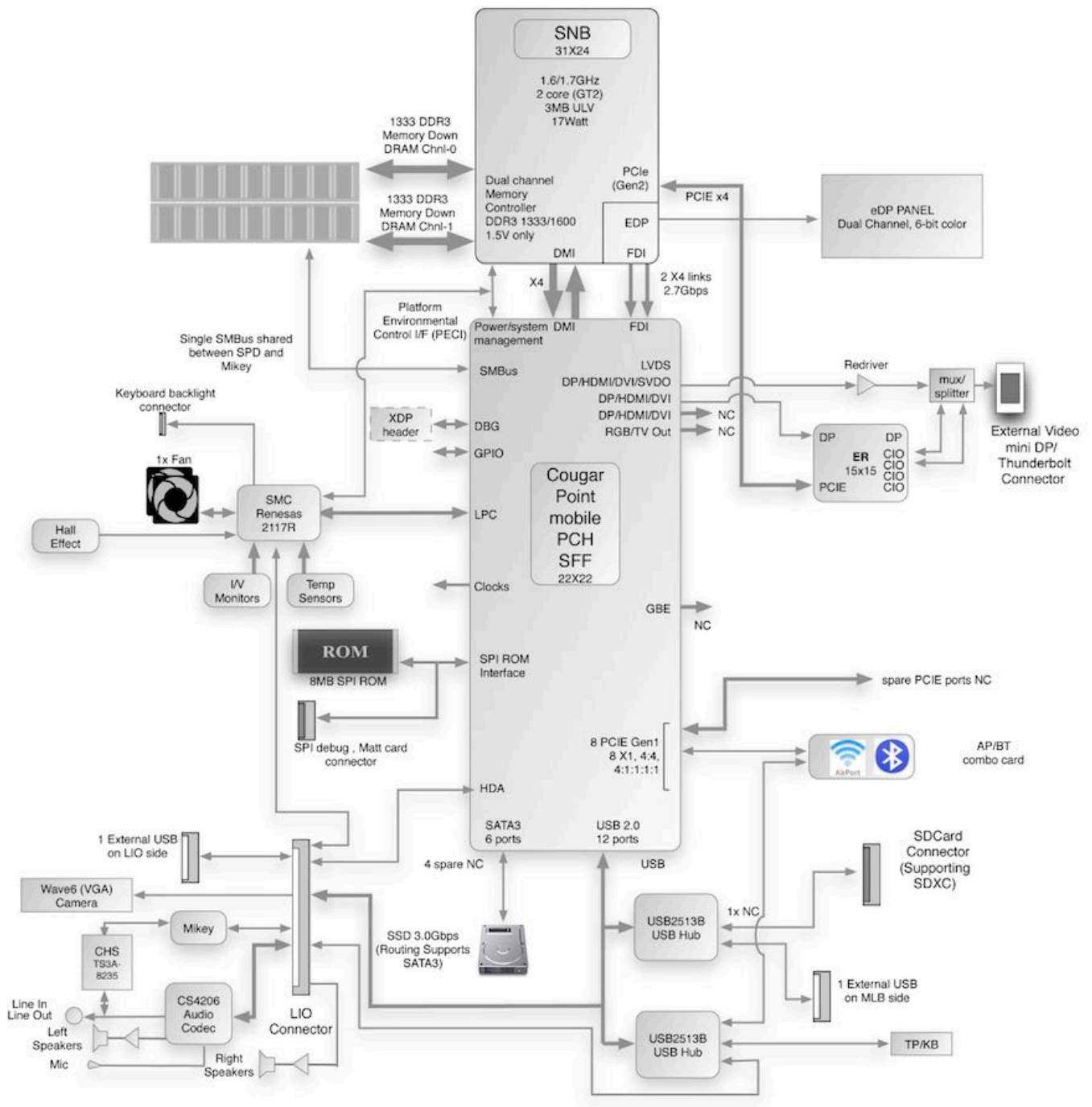
MacBook Air (13-inch, Late 2010): Block Diagram

Refer to this diagram to see how modules are interrelated.



MacBook Air (13-inch, Mid 2011): Block Diagram

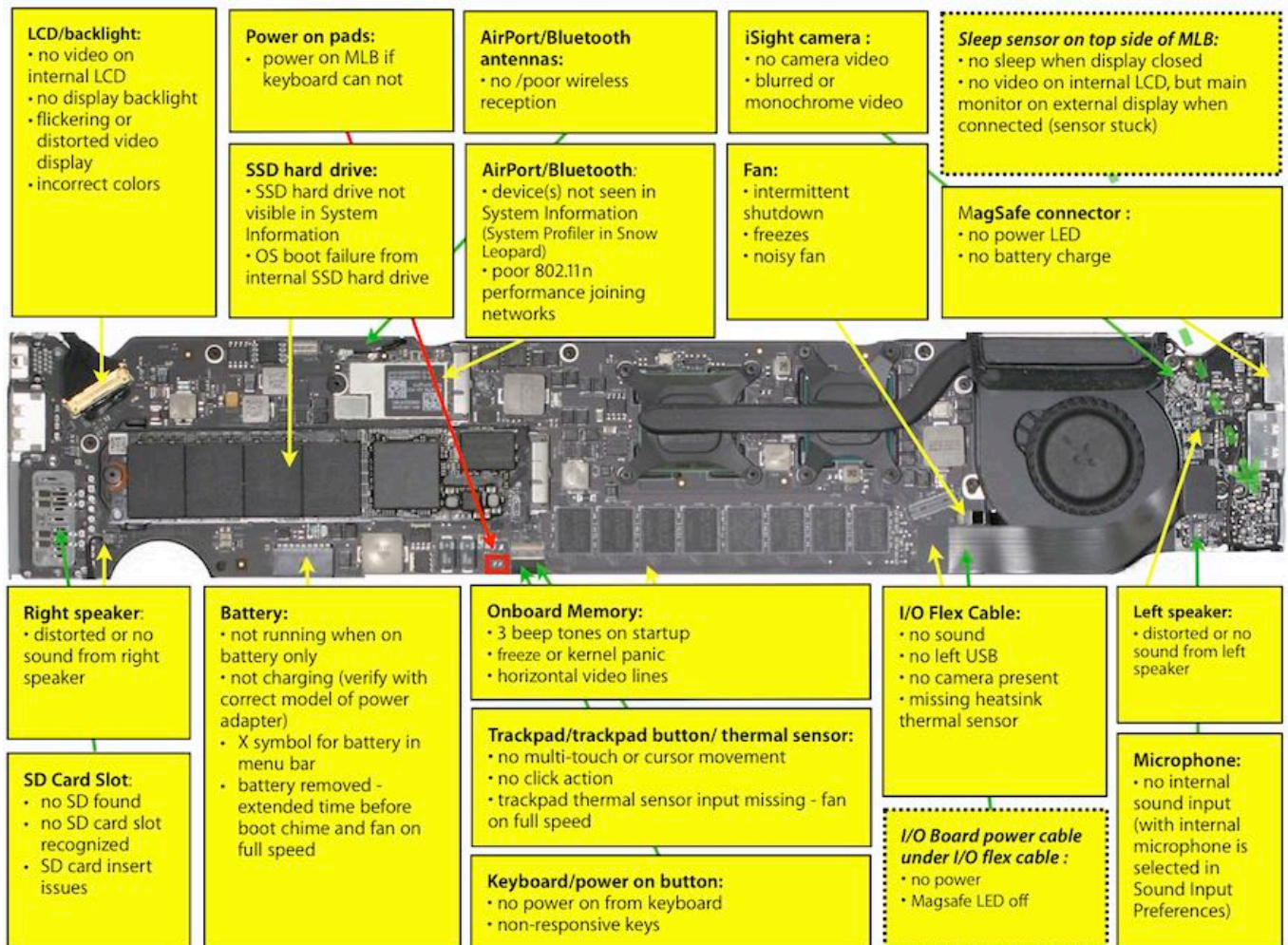
Refer to this diagram to see how modules are interrelated.



MacBook Air (13-inch, Late 2010): Functional Overview

Refer to this diagram for symptoms related to logic board connectors.

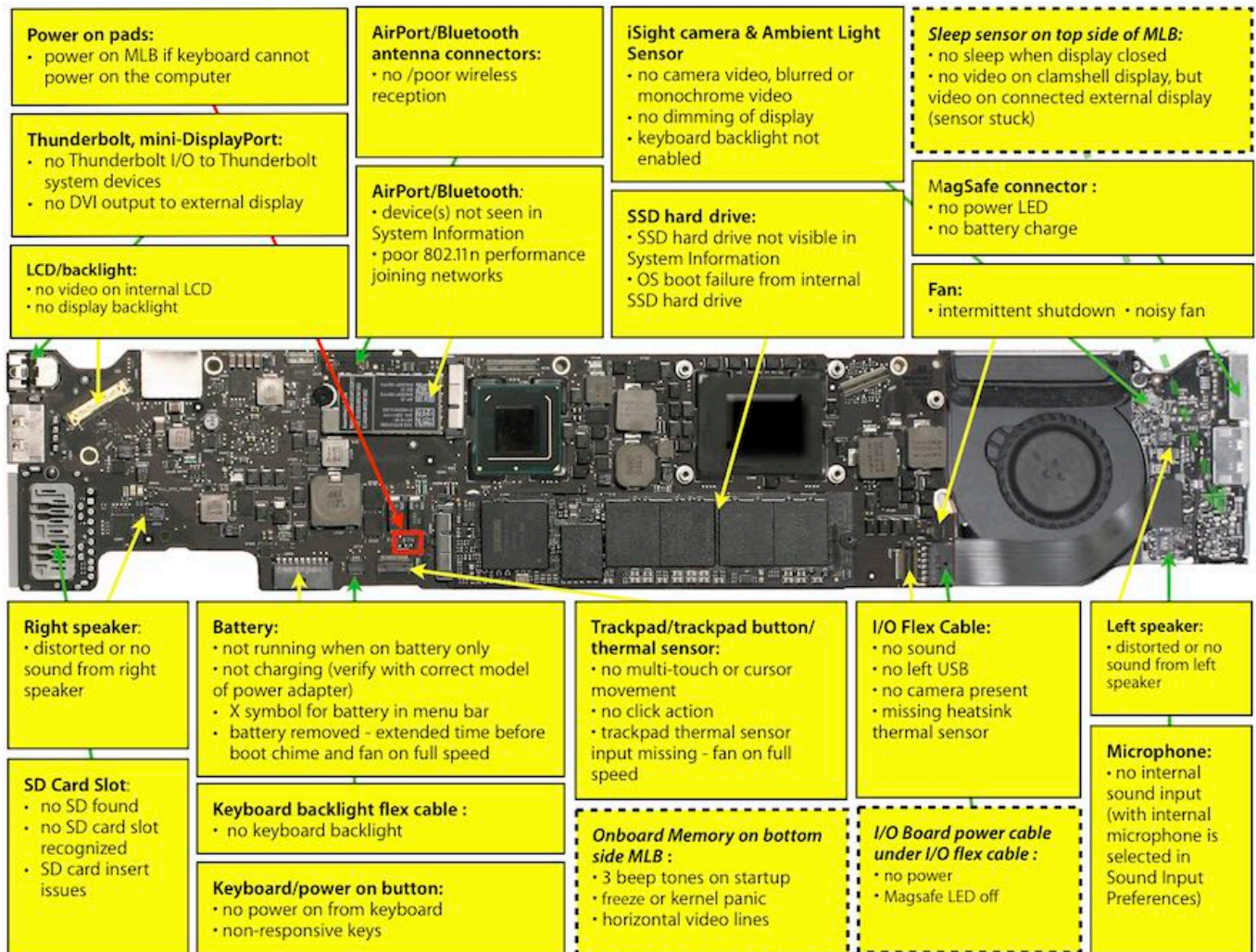
Note: For more information on reseating the I/O flex cable, see Apple Support article [OP490: MacBook Air \(Mid 2011 and Late 2010\): Alignment and reseating of LIO Flex Cable](#).



MacBook Air (13-inch, Mid 2011): Functional Overview

Refer to this diagram for symptoms related to logic board connectors.

Note: For more information on reseating the I/O flex cable, see Apple Support article [OP490: MacBook Air \(Mid 2011 and Late 2010\): Alignment and reseating of LIO Flex Cable](#).



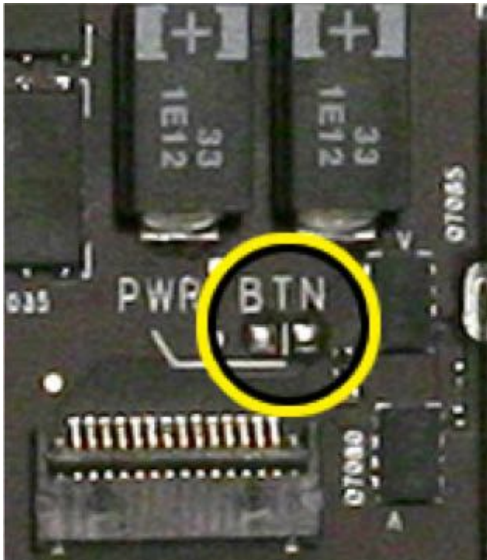
MacBook Air (13-inch, Late 2010 and Mid 2011): Logic Board Power-On Pads

On the logic board of the MacBook Air (13-inch, Late 2010 and Mid 2011), there are two pads that can be shorted to power on the computer. These pads are located near the input devices (IPD) flex cable connector on the logic board. The power-on pads are shiny, silver, square, and larger than the other (mostly round) silver pads nearby.

Important: Only short these two pads and no other pads, or you may damage the logic board. The tip of a T8 or T10 screwdriver is about the right size to touch these two pads, without touching other nearby components.

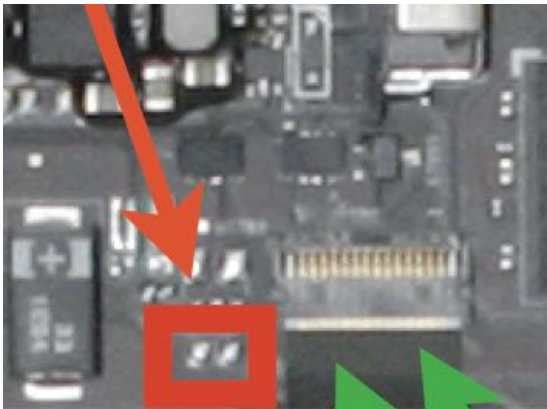
MacBook Air (13-inch, Mid 2011) Power-On Pads

The pads are located above the IPD flex cable connector.



MacBook Air (13-inch, Late 2010) Power-On Pads

The pads are located to the left of the IPD flex cable connector, along the lower edge of the logic board.



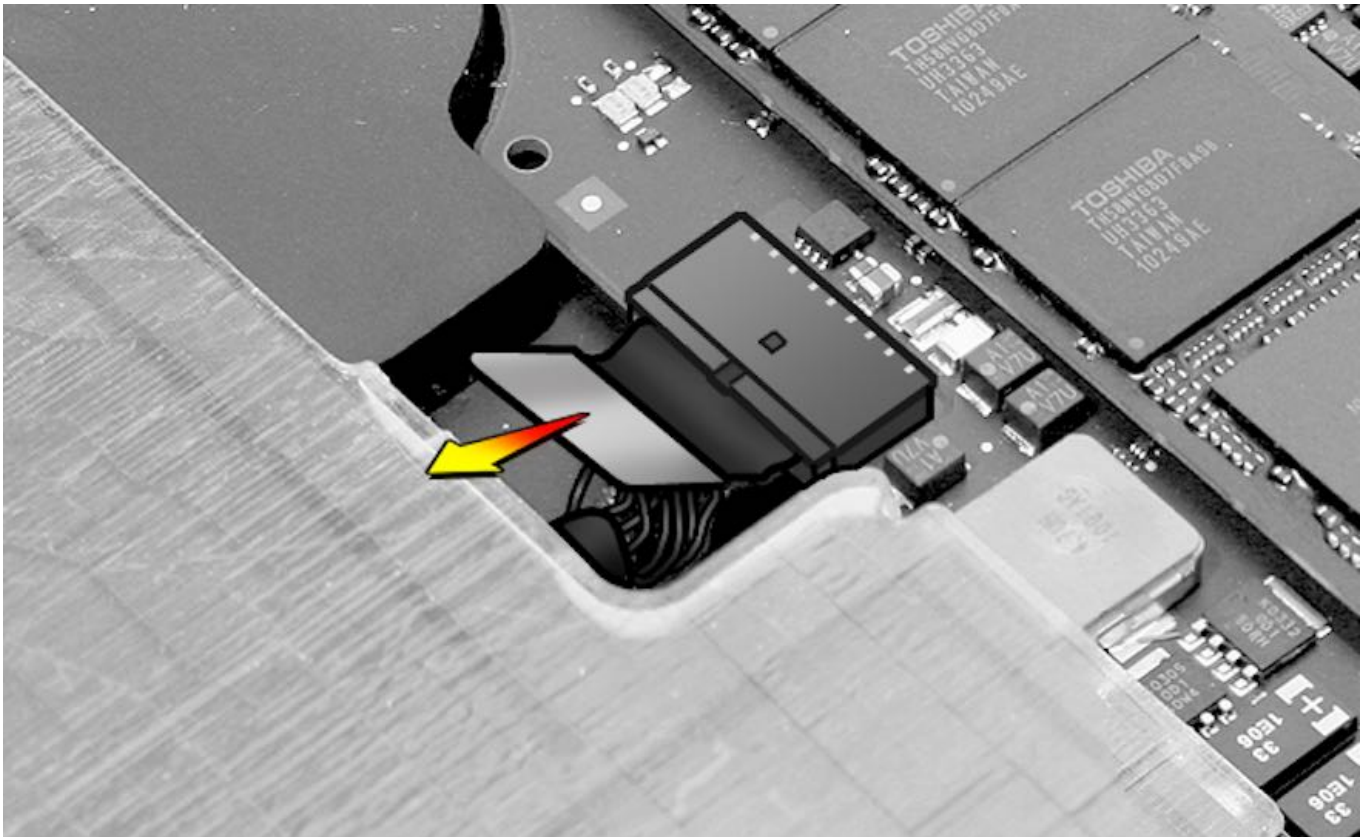
MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Connector Types on Logic Board

On the logic board are several types of connectors, each requiring special handling. Make sure you read these tips before disconnecting and installing the connectors.

Battery Connection

1. Pull tab on battery to disconnect.
2. Use fingers to slide cable into connector.

For video instruction, refer to Apple Support article [SV79: Battery Connectors Video](#).



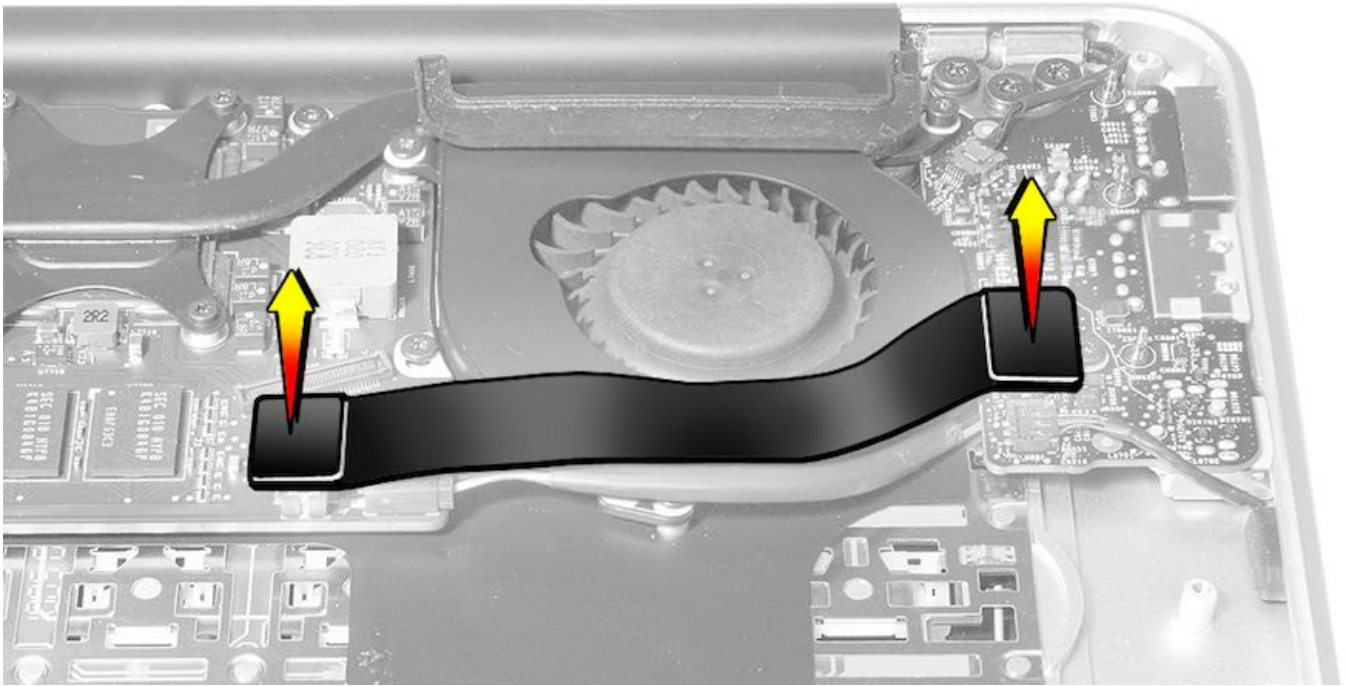
Low-Profile Solid Platform Flex

1. Remove and insert I/O flex cable connector vertically. The connectors are susceptible to bent pins if inserted improperly.
2. Keep connector level to board and press evenly to install cable.

Example:

- I/O flex cable

For video instruction, refer to Apple Support article [SV89: Solid Platform Flex Connectors Video](#).



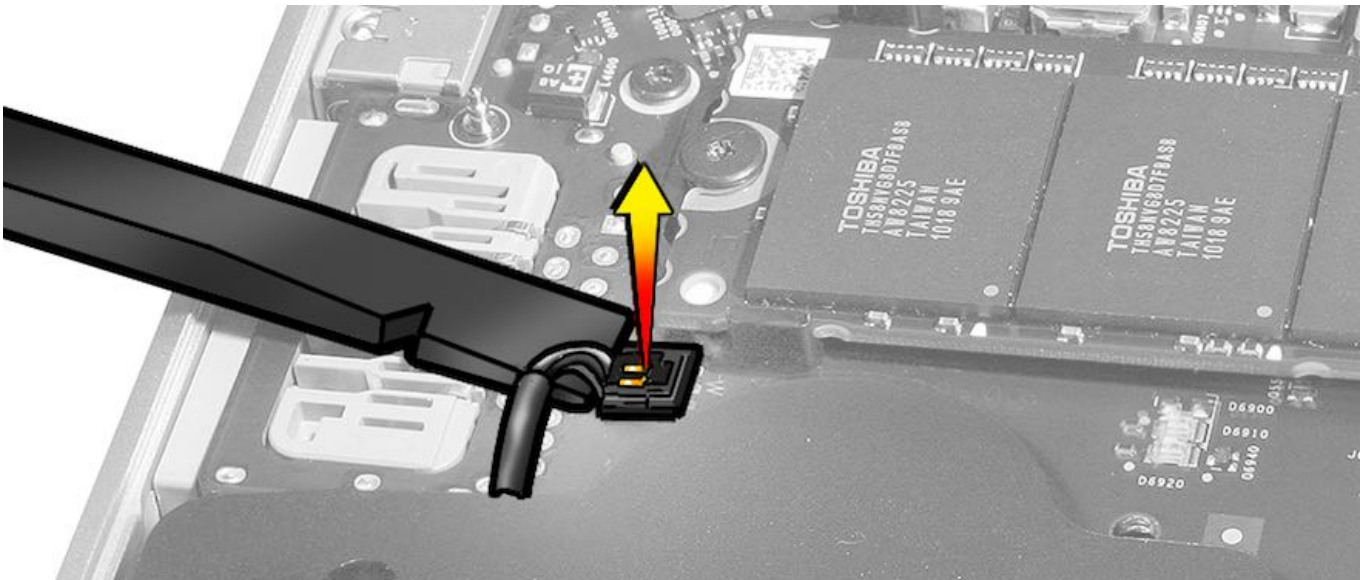
Vertical Insertion (JST)

1. Use black stick under cable to remove.
2. Keep connector level to board when disconnecting and reconnecting.
3. Press evenly when reconnecting or connector can be tipped up and not fully seated.

Examples:

- Right speaker
- Left speaker

For video instruction, refer to Apple Support article [SV83: Japan Solderless Terminal \(JST\) Connectors Video](#).



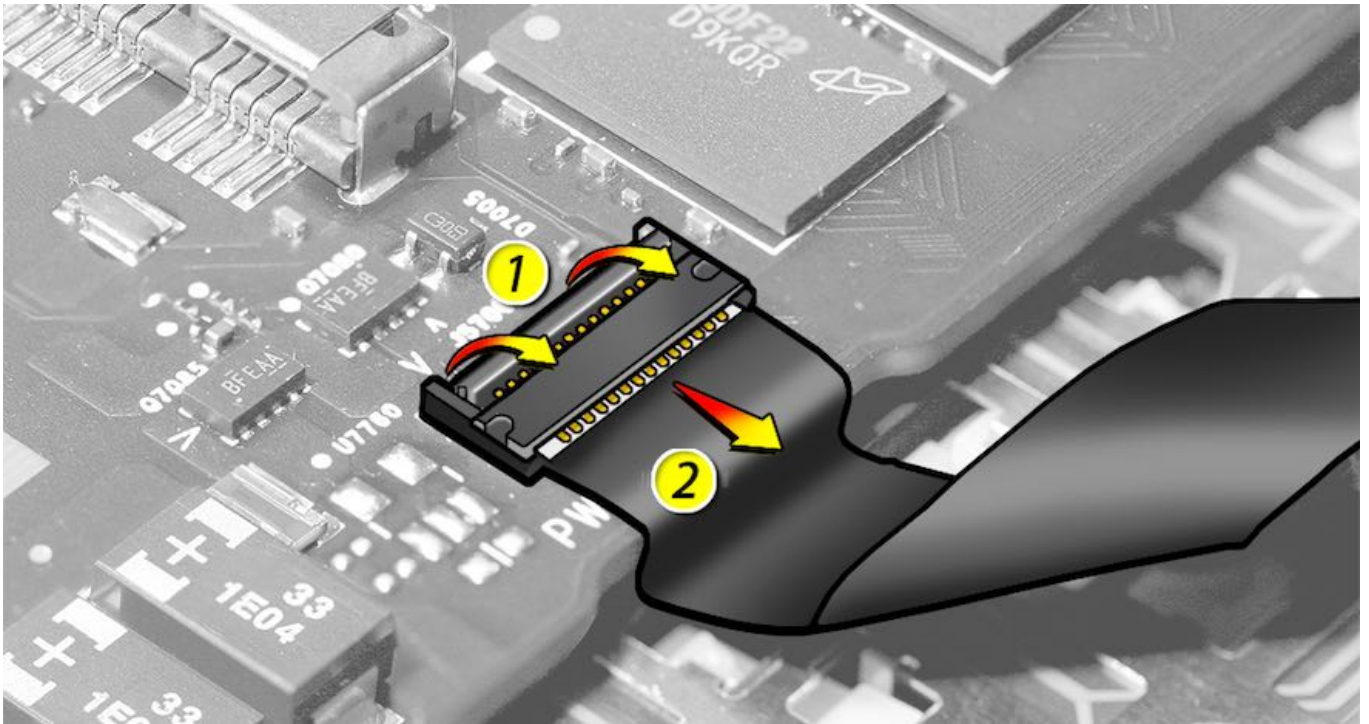
Locking Lever

1. Flip up lever 90 degrees for cable removal.
2. Slide connector into receptacle on same horizontal plane as logic board.
3. Lock down lever after inserting cable.
4. Close lever when handling or shipping a logic board module, whether a known-good or a known-bad board.

Examples:

- Fan
- Keyboard input cable (IPD)
- Trackpad flex cable

Important: Push IPD flex cable all the way into connector to prevent “no power” symptoms.

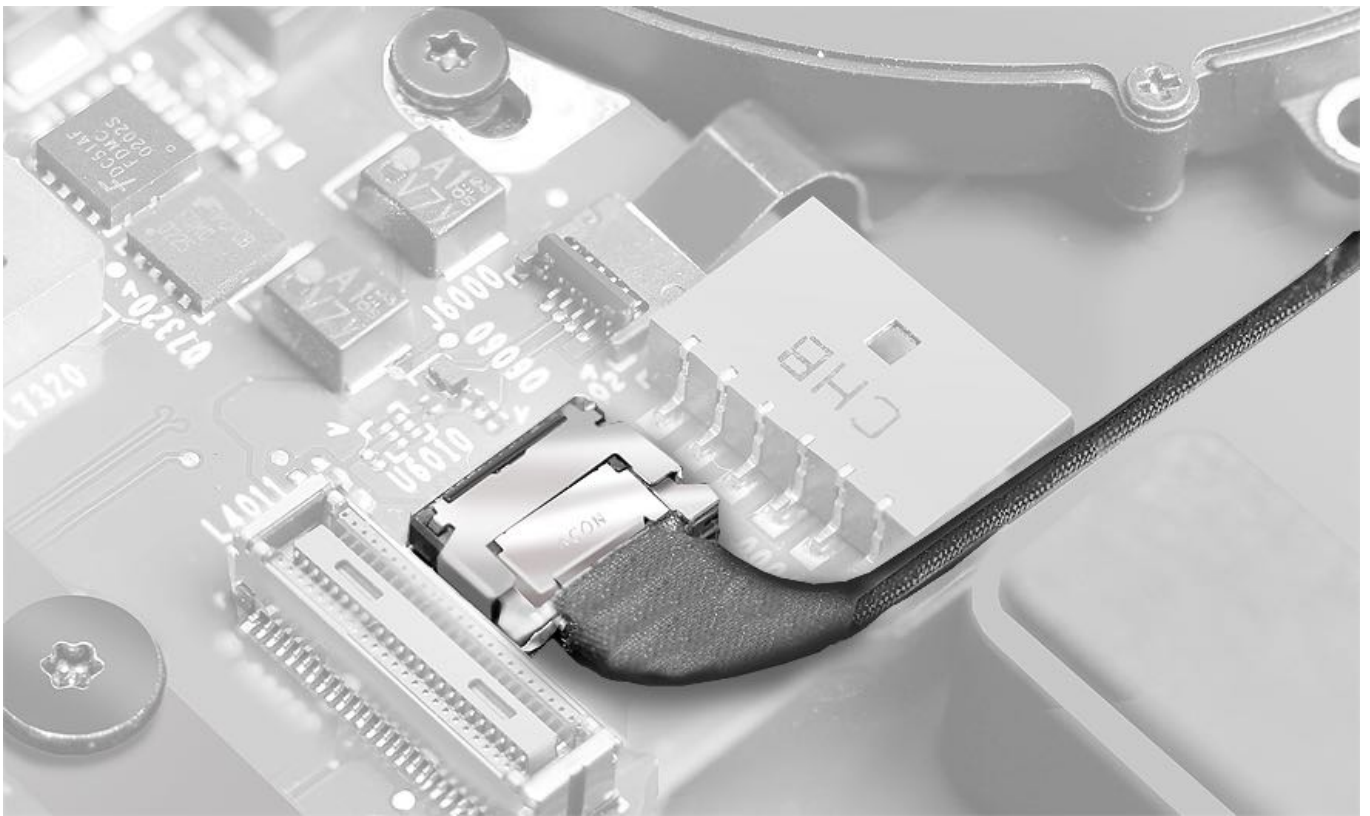


Thin, Multi-Pin Horizontal Insert

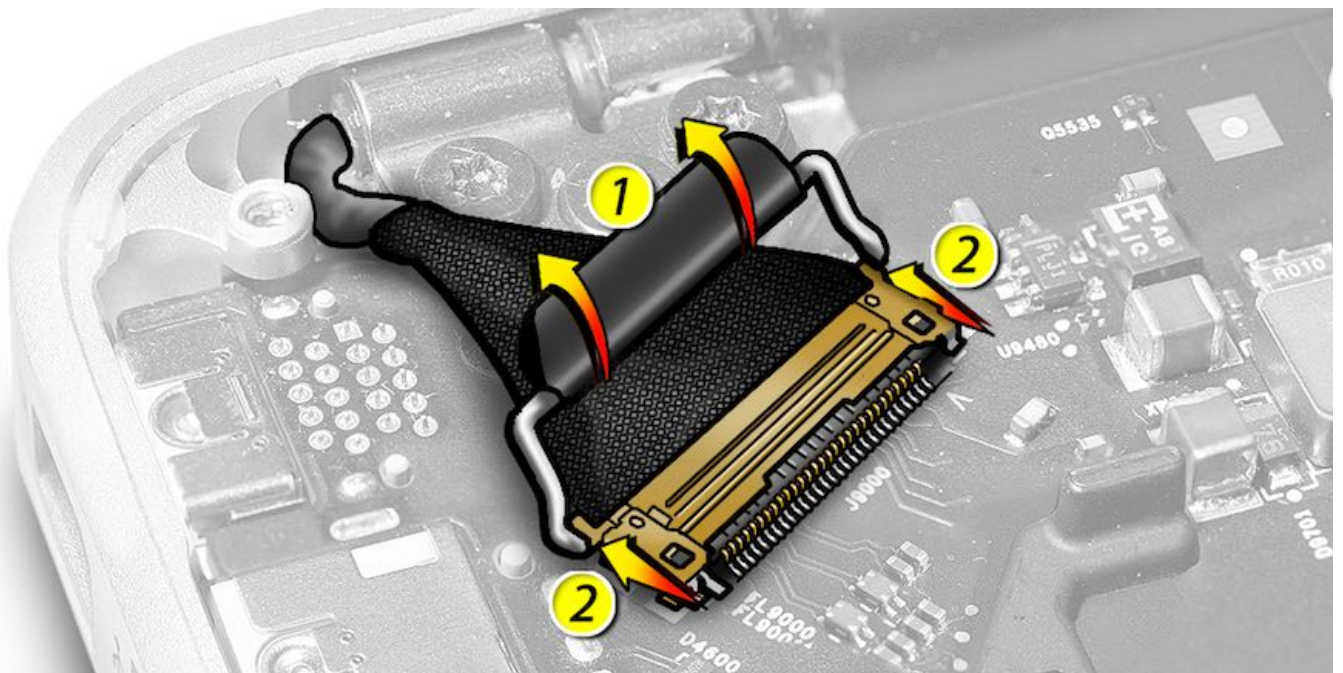
1. Use black stick on alternating sides to evenly disconnect cable.
2. Slide connector into receptacle on same horizontal plane as board.

Examples:

- Camera cable
- Display cable (EDP)



Note: Flip over lock bar before disconnecting EDP cable, but do not use bar as a handle. When cable is fully installed, flip lock bar over leads to secure cable in place.



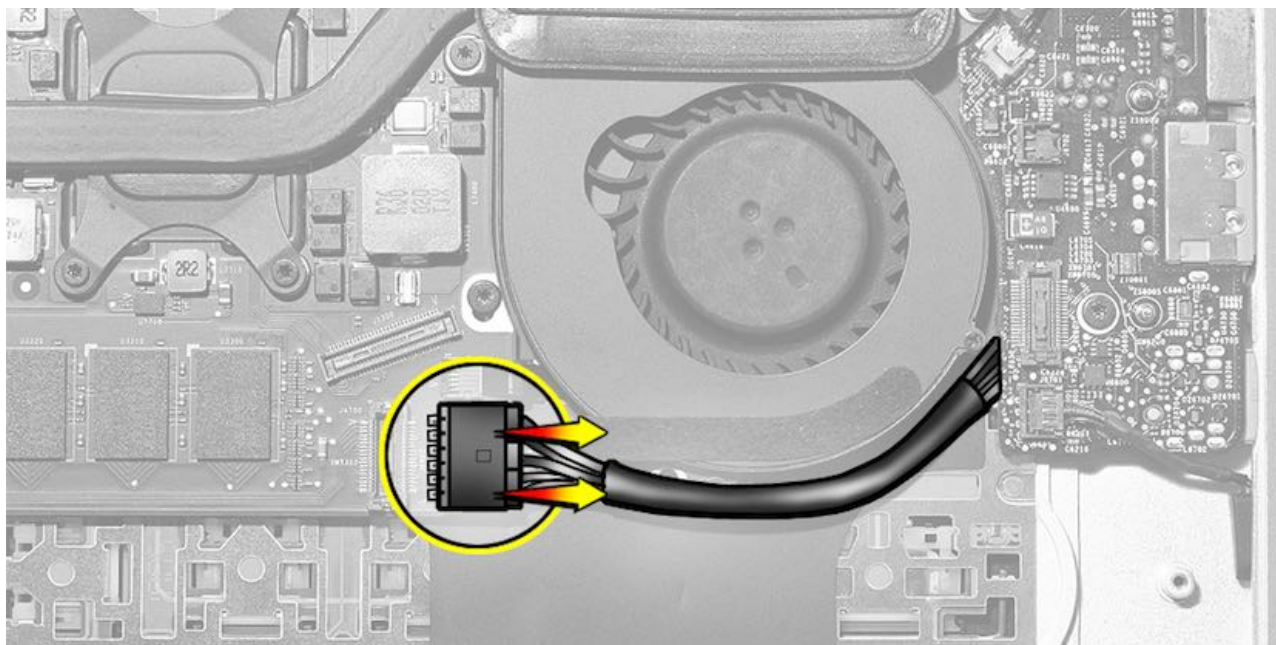
Horizontal Install

1. Pull connector, not cable, to remove.
2. Slide connector into receptacle on same horizontal plane as board.

Example shown:

- I/O power cable

For video instruction, refer to Apple Support article [SV81: Horizontal-Install Connectors Video](#).



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Tools

Caution: To prevent scratches or other cosmetic damage to the computer housing, use a soft cloth as a protective layer when removing and installing the external screws.

The following tools are required to service this computer:

- Clean, soft, lint-free cloth
- ESD-safe workstation, including an ESD mat and wrist or heel strap
- ESD bags (for storing ESD-sensitive parts while removed from unit)
- Pentalobe screwdriver (Apple part 923-0731)
- Protective battery cover (Apple kit part 076-1372 or cover only, 922-9735)
- Phillips #000 screwdriver, magnetized
- Torx T5 screwdriver, magnetized
- Torx T8 screwdriver, magnetized
- Black stick (nylon probe, Apple part #922-5065) or other nonconductive nylon or plastic flat-blade tool
- EMI-safe plastic or nylon tweezers for AirPort/Bluetooth cables
- Thermal grease syringe (Apple part #922-7144)
- Alcohol wipes
- Kapton tape
- Pencil, to mark microphone alignment
- Magnifying glass, for reading serial number etched on bottom case
- Digital volt meter (troubleshooting)

For more information about ESD, refer to:

- [OP100: Electrostatic Discharge Precautions and Myths](#)
- [AppleCare Service Training: ESD Precautions](#)

Take Apart Procedure Notes

Reassembly Steps

When no replacement steps are listed, replace parts in exact reverse order of Removal procedure.

Note About Images in This Guide

In some cases a pre-production model may have been used to document the procedures in this guide. Although there may be small differences in appearance between the image pictured and the computer you are servicing, the procedures are the same unless noted.

Screw Sizes

All screw sizes shown are approximate and represent the total length of the screw.



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Bottom Case

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

- Shut down computer.
- Unplug all cables.
- Put on ESD strap.
- Place computer face down on a clean, flat surface.



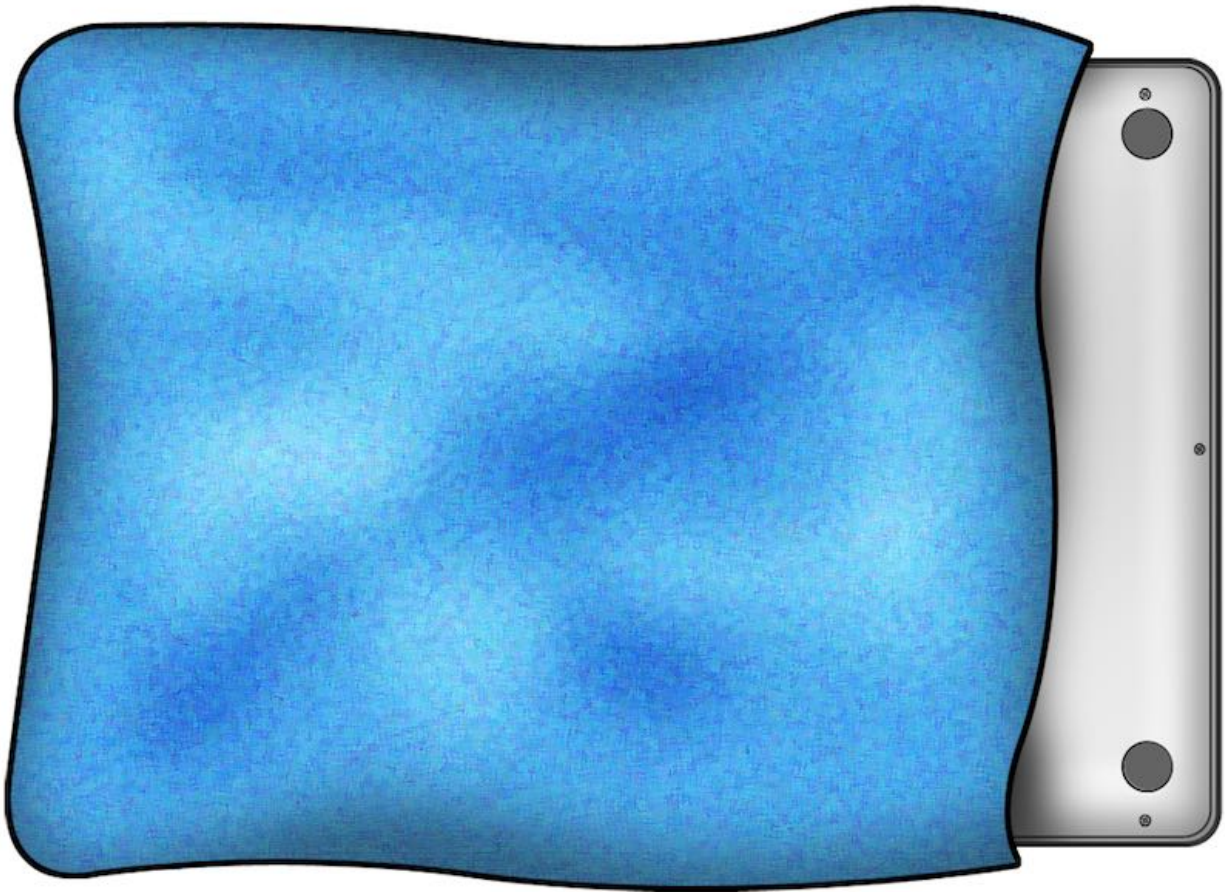
Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Pentalobe screwdriver
- Black stick



Steps For Removal

Caution: To prevent scratches, use a protective cloth when working with metal tools.



1. Remove 10 Pentalobe security screws: (L=Long)

Late 2010: (2L)
922-9659 (9 mm)



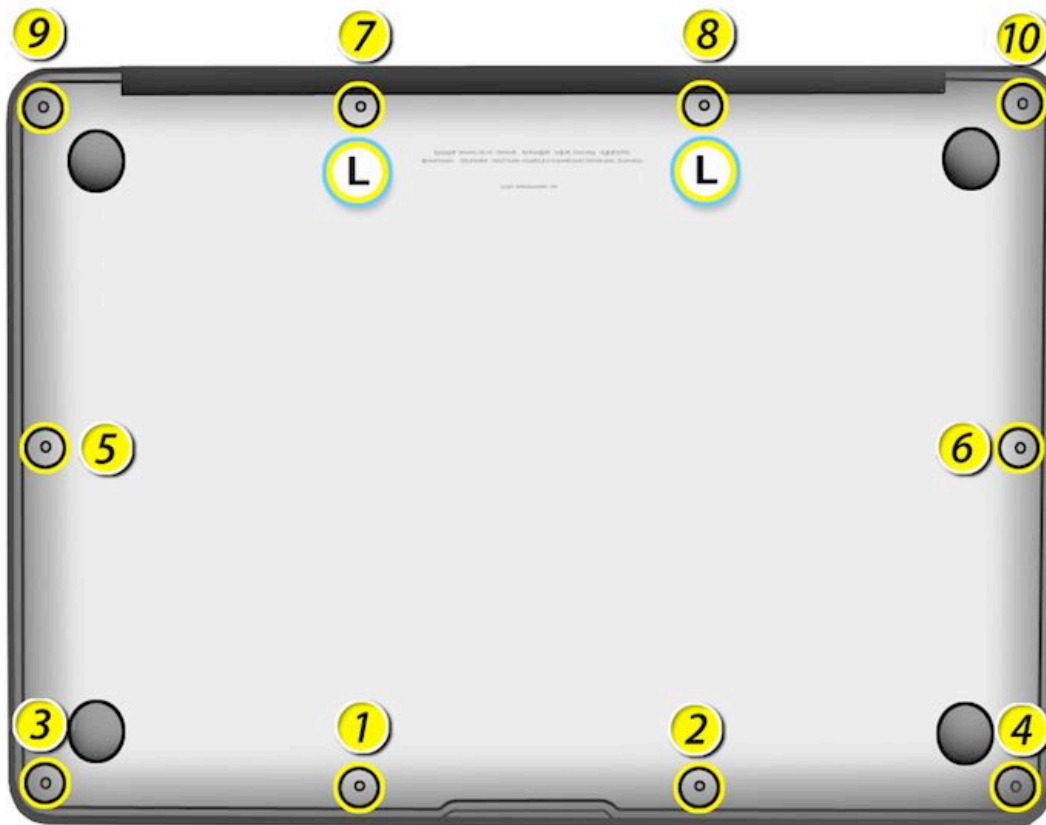
Mid 2011/2012/2013, Early 2014: (2L)
922-9755 (9 mm)



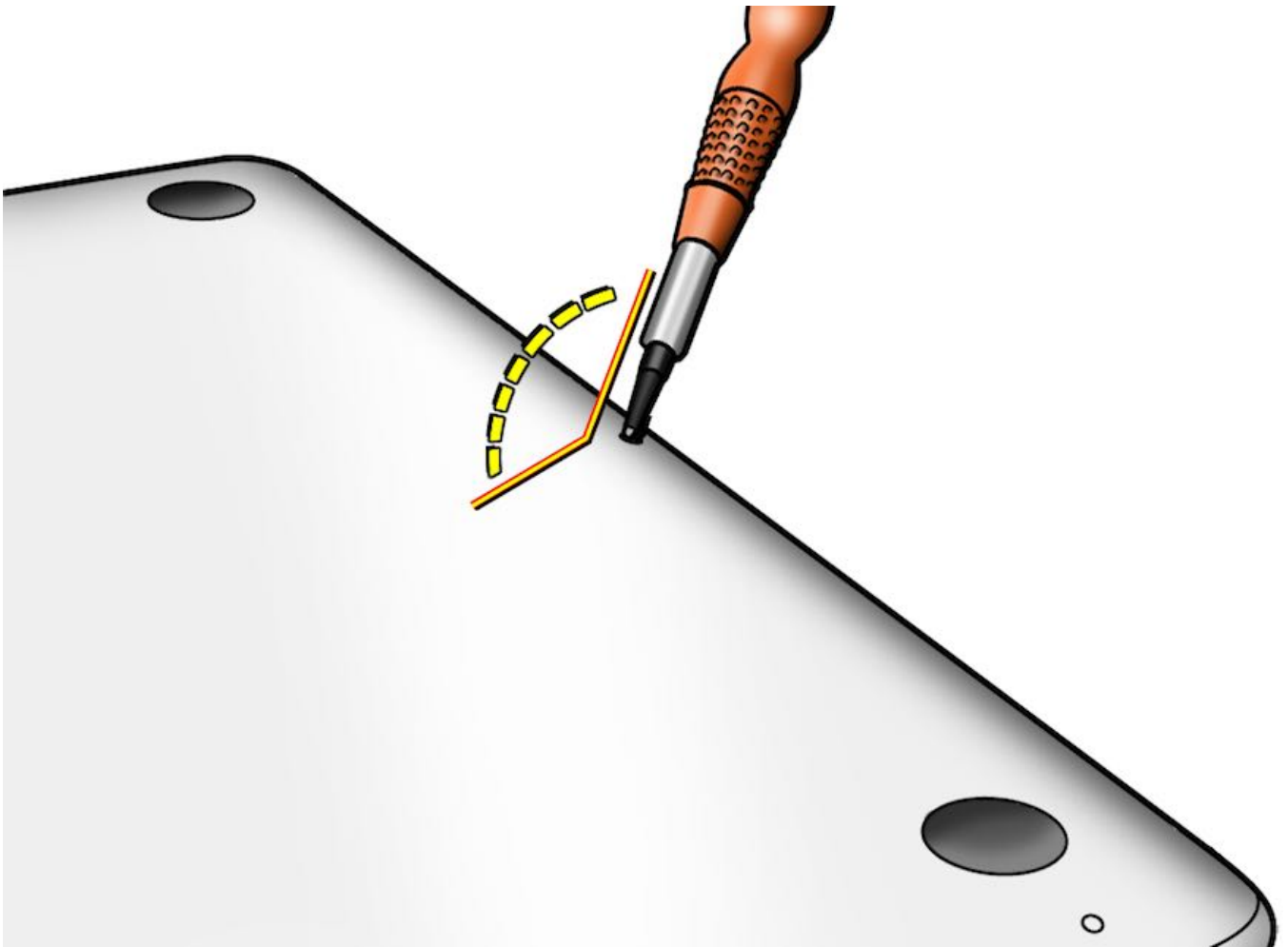
Late 2010, Mid 2011:
(8) 922-9685 (2.48 mm)



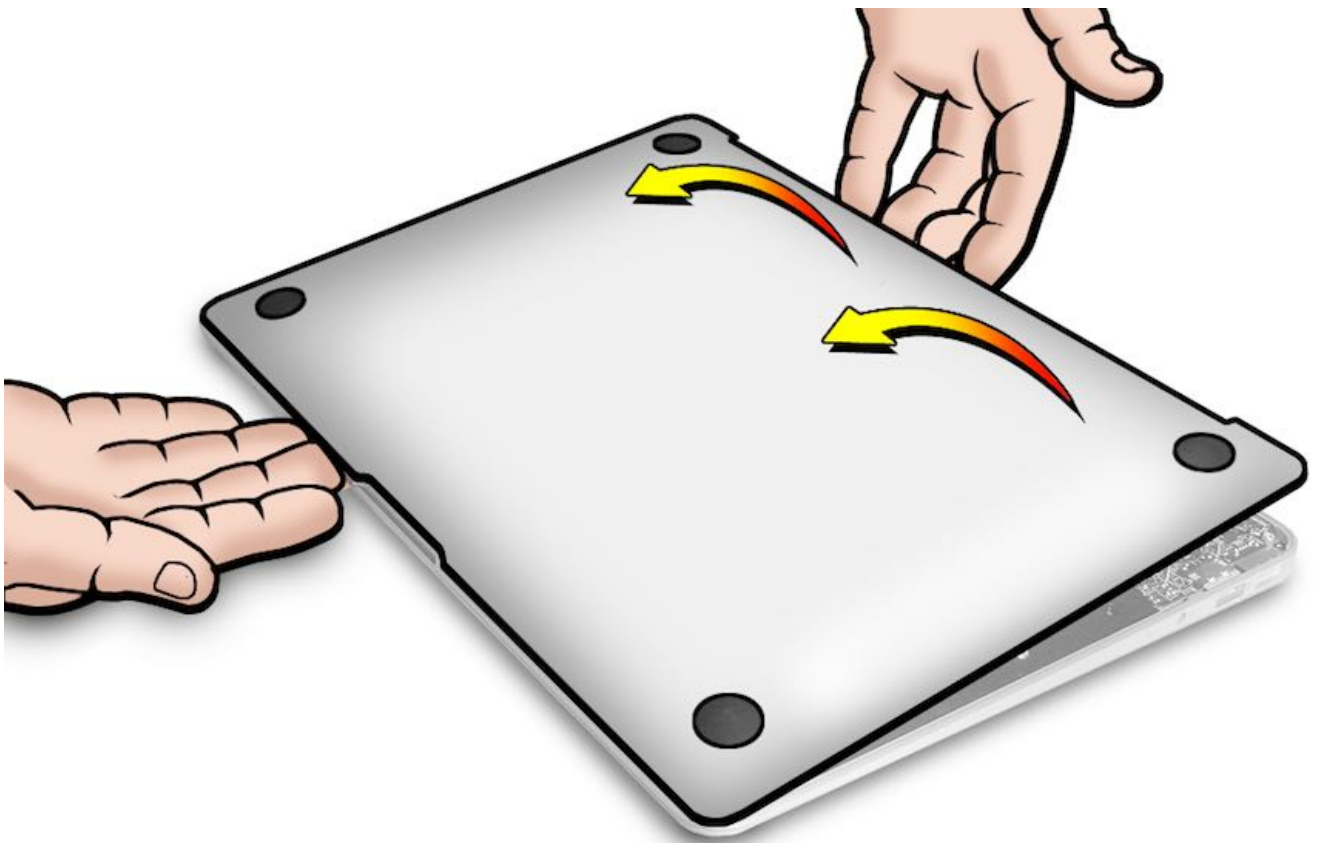
Mid 2012/Mid 2013, Early 2014:
(8) 923-0122 (2.48 mm)



Important: All screws must be removed and installed at an angle.

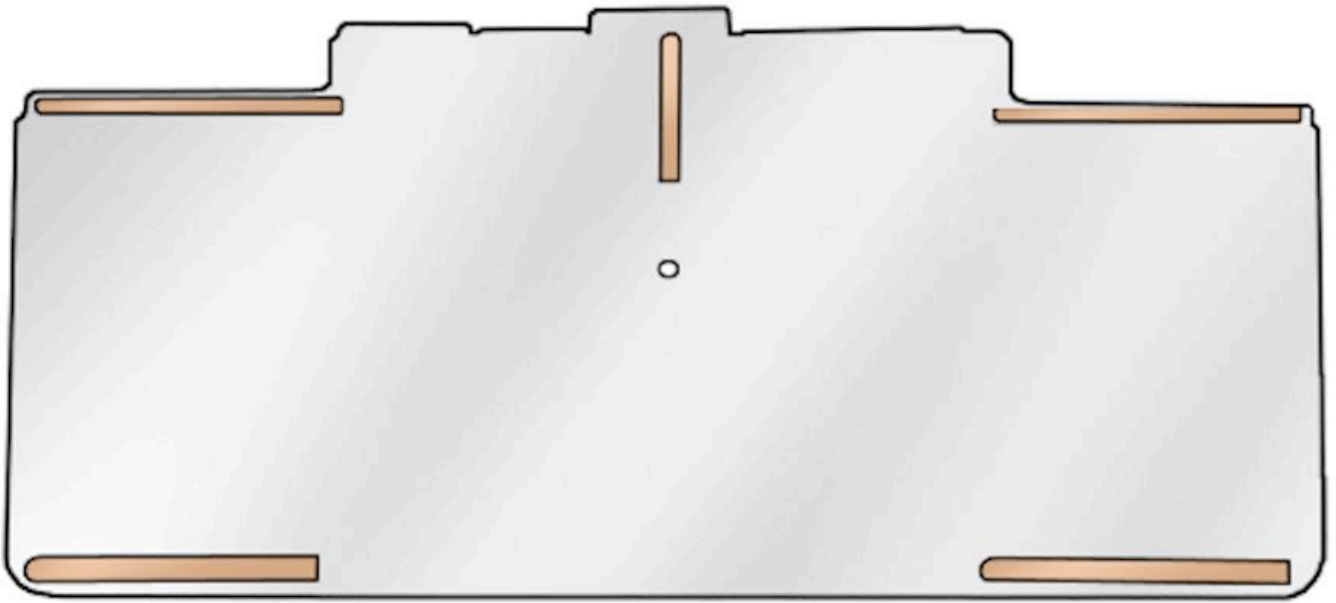


2. Lift from top edge and remove bottom case.



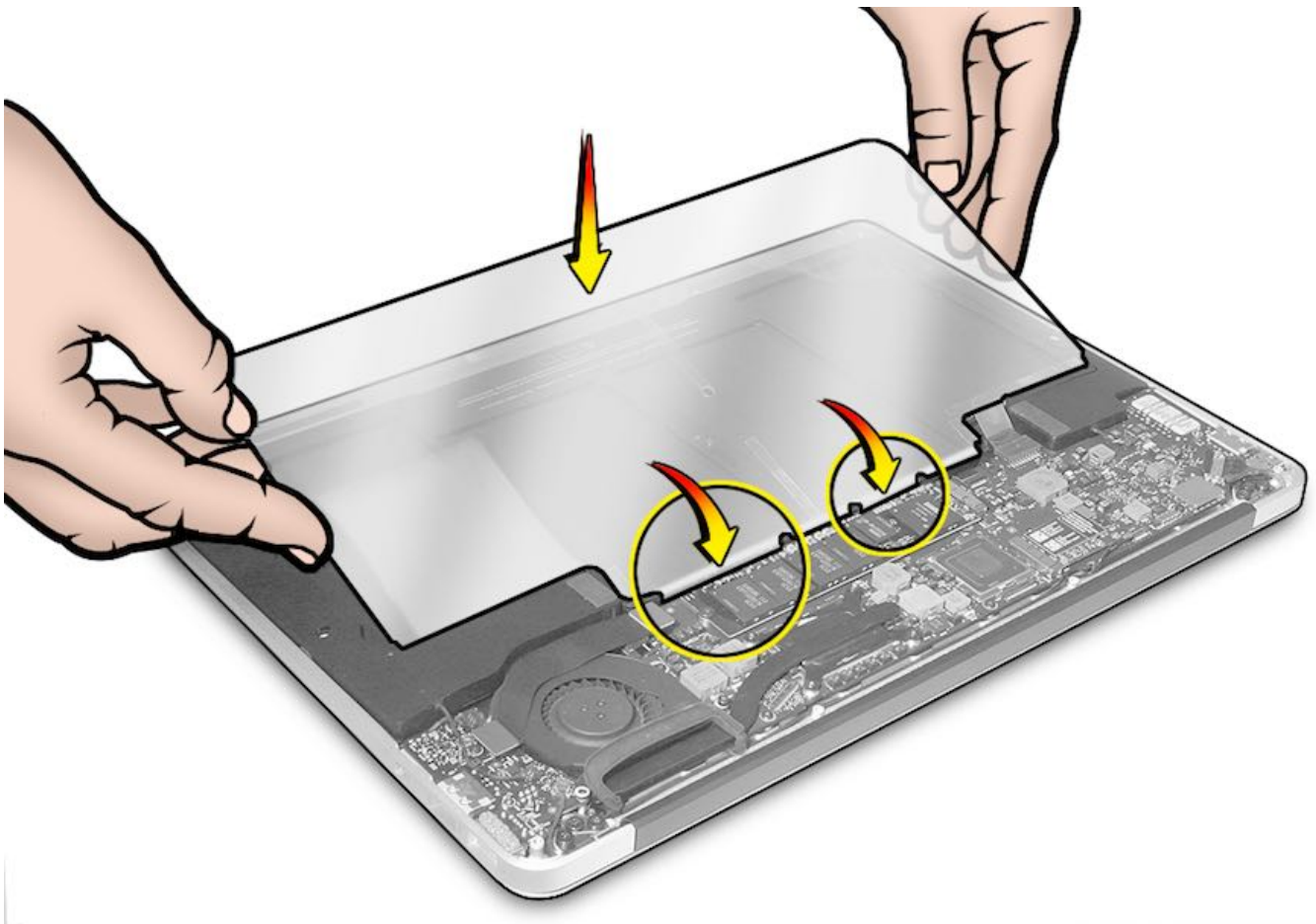
Important: Immediately after removing bottom case, always attach battery cover and disconnect battery cable from logic board. Refer to Apple Support article [TP382: Battery Safety Precautions](#).

3. Remove adhesive strips from clean battery cover.



4. Using hooks at top of battery cover, tilt cover onto battery.

5. Gently secure cover by running your finger over adhesive locations.



6. Pull battery connector tab toward battery to disconnect it from logic board.

Important: Disconnect battery whenever performing repairs. There is no need to remove battery unless it blocks module being repaired.



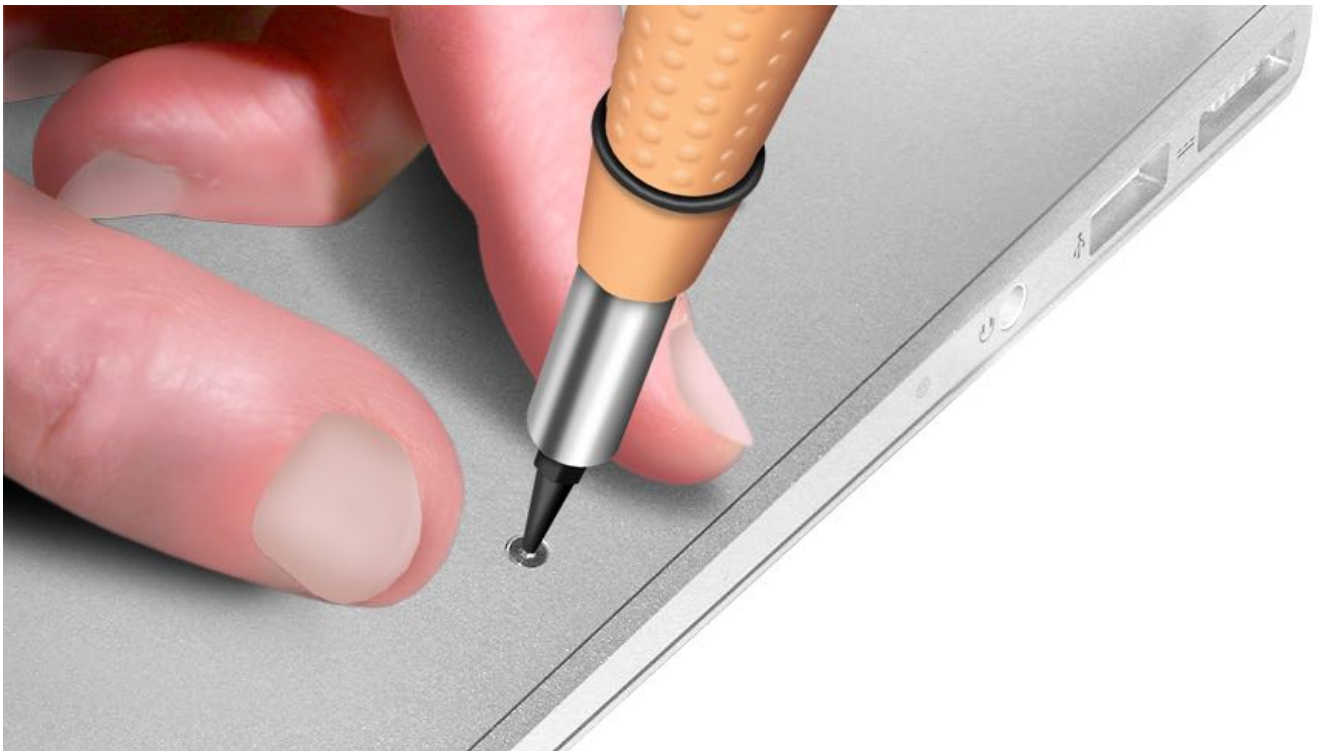
Steps For Reassembly

Note: If you are installing a replacement bottom case, use a fine-tipped permanent marker to write the original system serial number inside the bottom case.

1. Make sure bottom case interior is clean and free of debris.
2. Reconnect battery cable to logic board.
3. Remove battery cover from battery.
4. Install bottom case from front. Press lightly to ensure internal clip “snaps” onto battery.
5. Confirm all screw holes are aligned before installing screws.



Note: To prevent offsetting bottom case, press with 2 fingers around each screw hole before and during screw installation.



6. Install 10 Pentalobe security screws in order indicated.

Note: If sequence is not followed, bottom case might wobble when placed on level surface.

Late 2010: (2L)
922-9659 (9 mm)



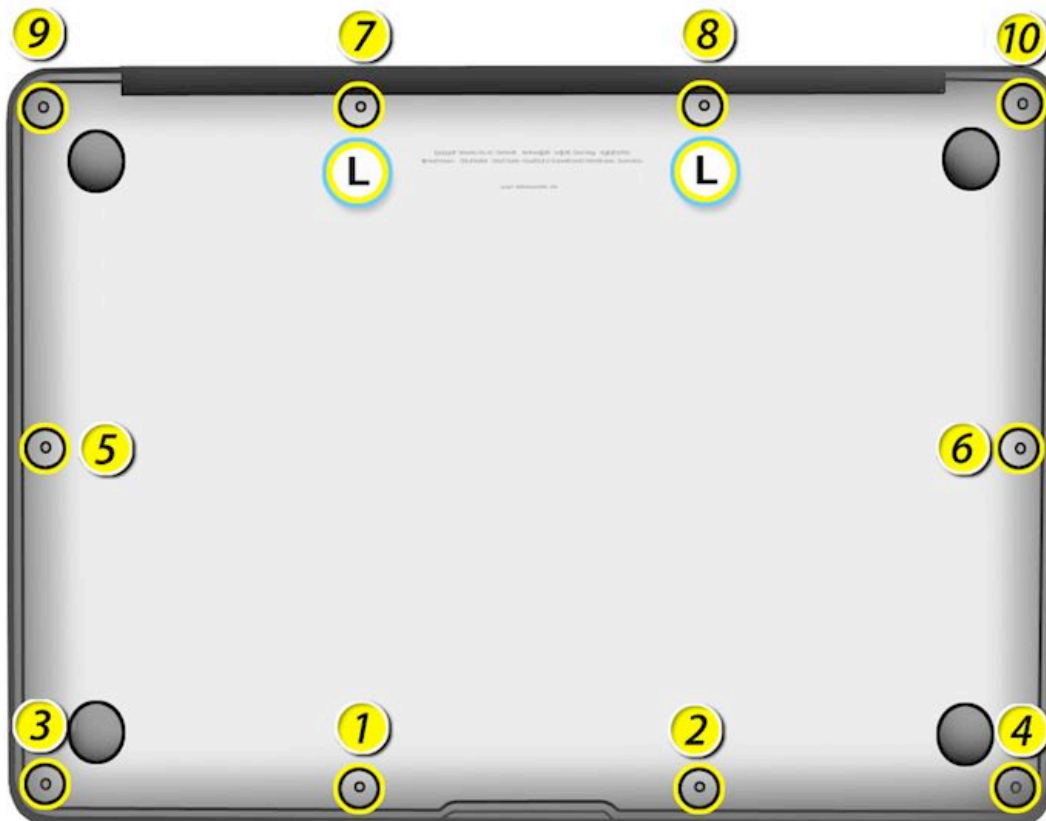
Mid 2011/2012/2013, Early 2014: (2L)
922-9755 (9 mm)



Late 2010, Mid 2011:
(8) 922-9685 (2.48 mm)



Mid 2012/Mid 2013, Early 2014:
(8) 923-0122 (2.48 mm)



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Battery

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV160: Battery Replacement Video](#).

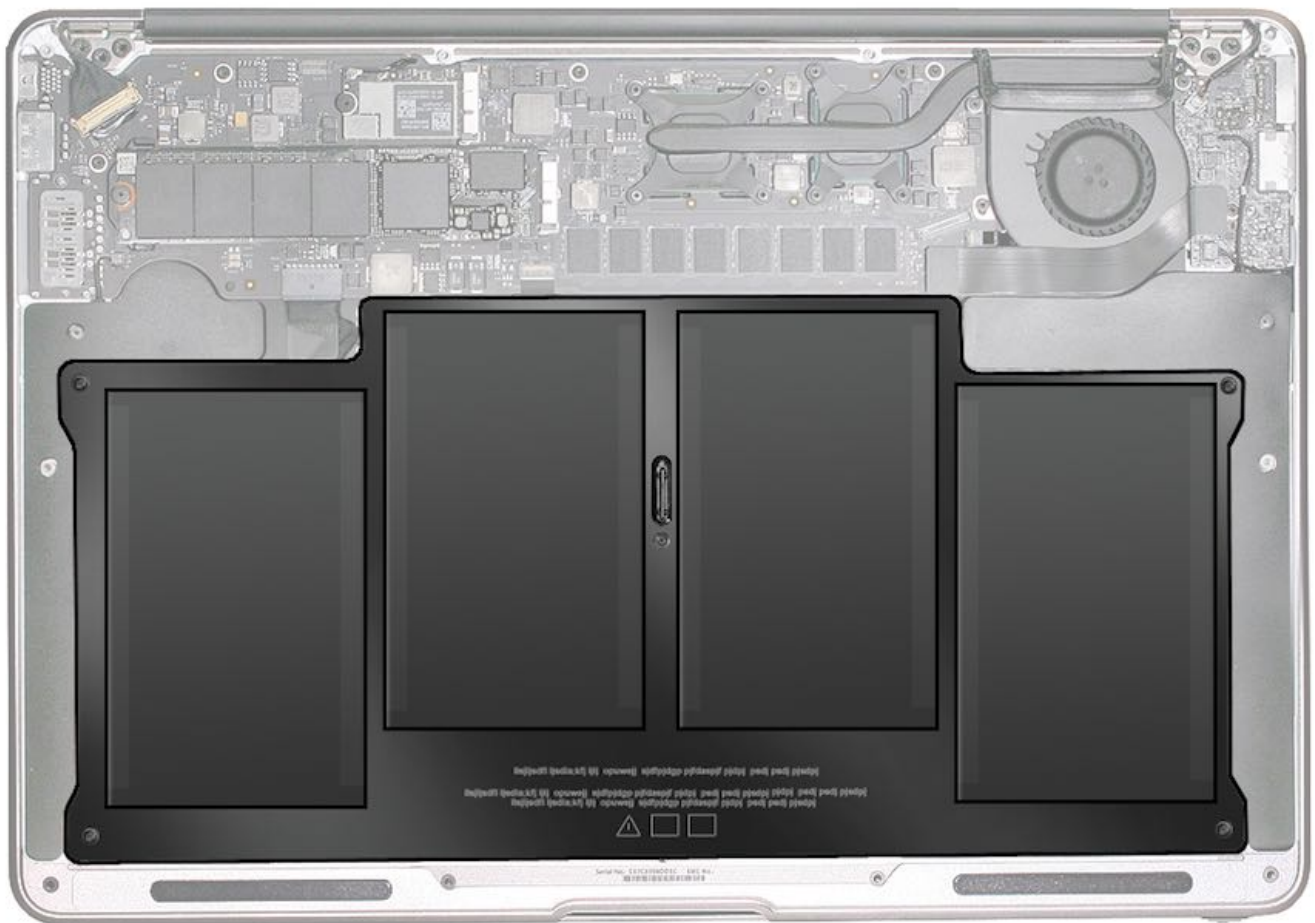
Remove:

- [Bottom Case](#)



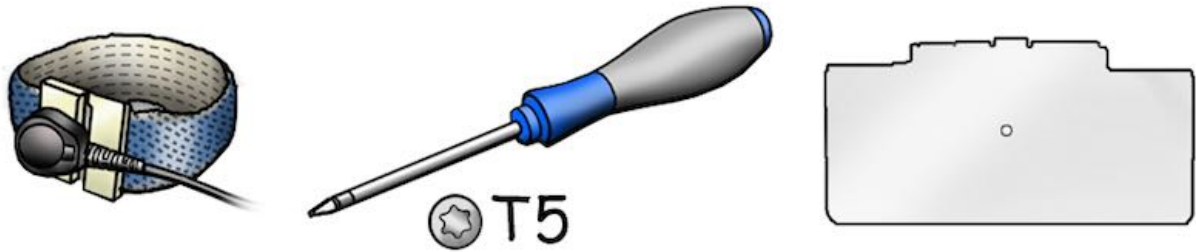
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

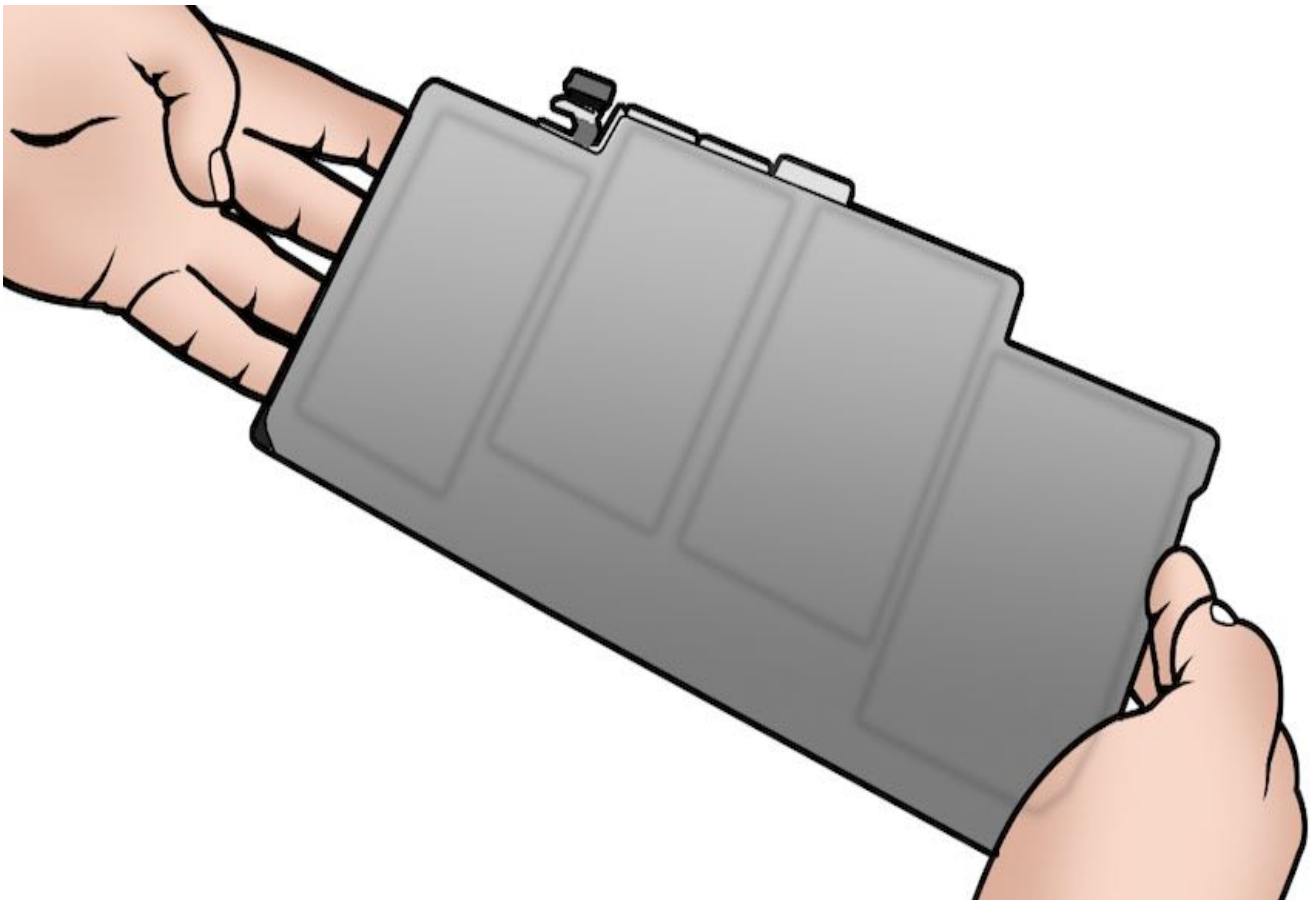
- ESD wrist strap
- Protective battery cover, 922-9735 or 076-1372 (kit)
- Torx T5 screwdriver, magnetized



Steps For Removal

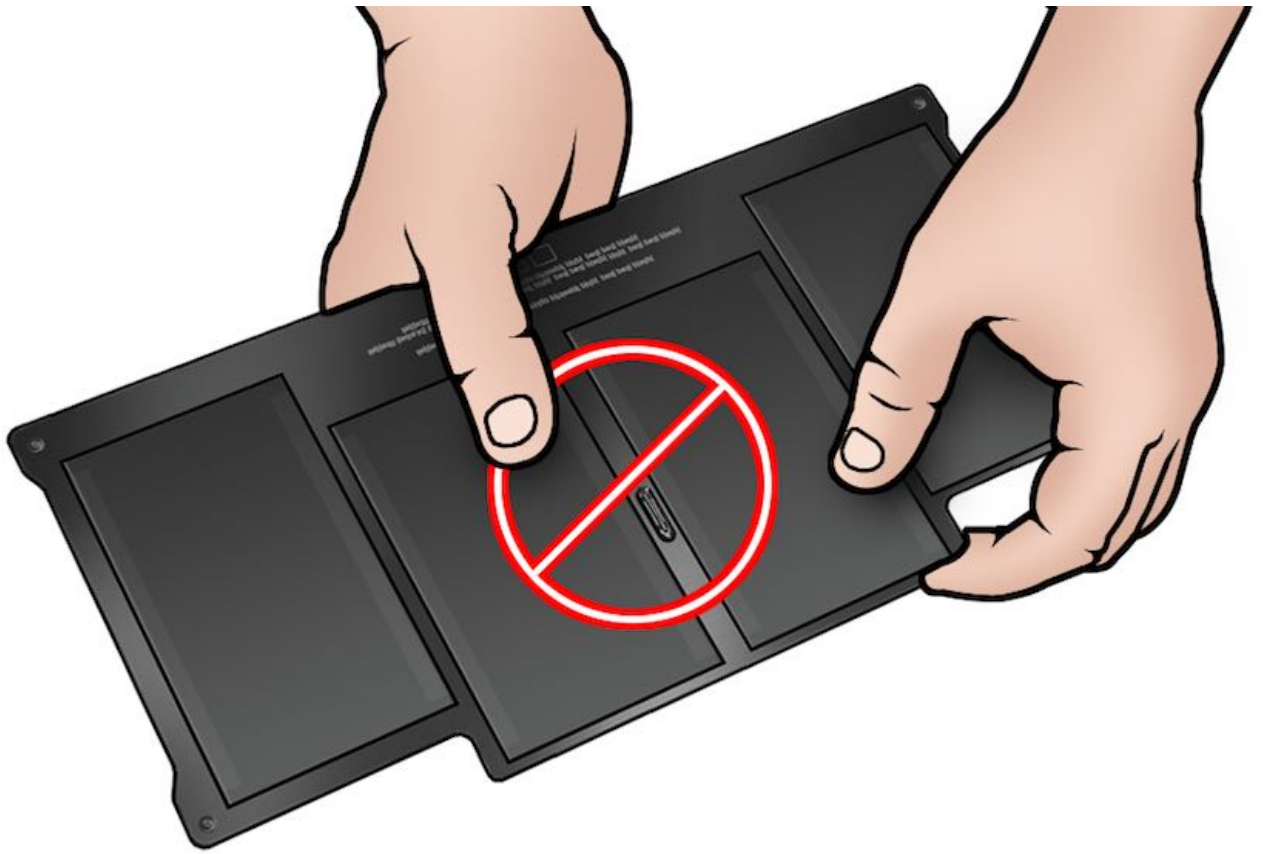


Warning: The battery contains several exposed, soft battery packs. Always attach the battery cover immediately after removing the bottom case.



Important:

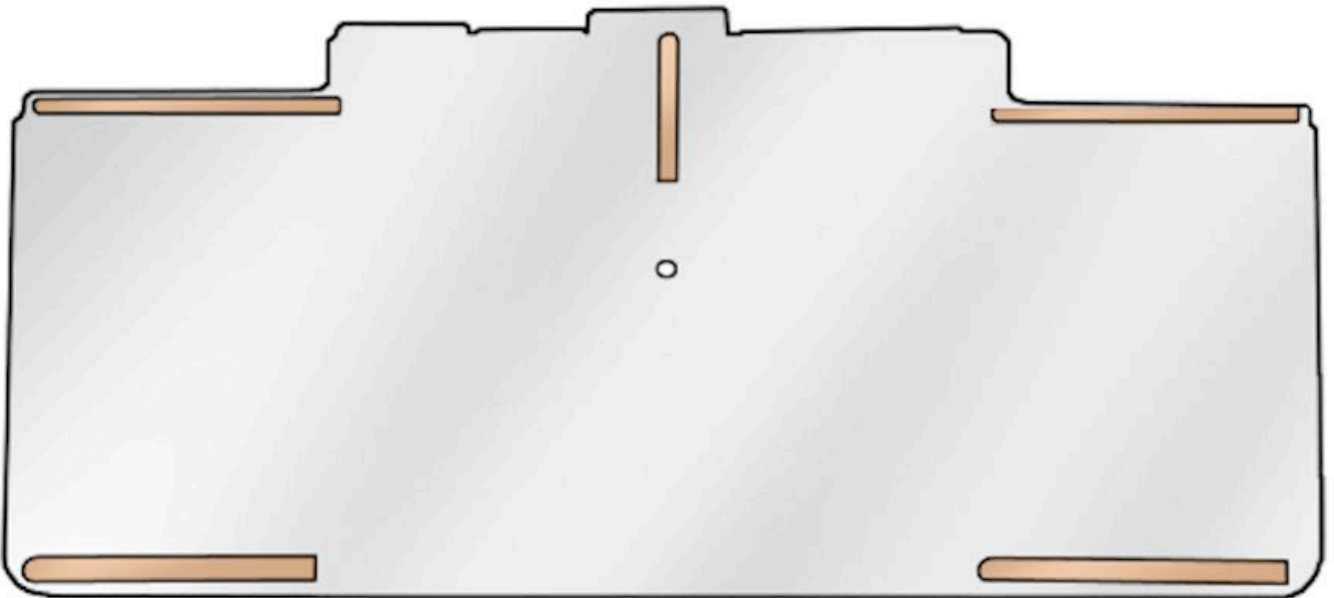
- Keep battery cover on battery at all times when battery is out of the computer.
- Handle battery with utmost care.
- Hold battery by edges only, with two hands at all times.
- Do not drop, stack, puncture, press, squeeze, crush, flex, twist or torque, or apply unnecessary pressure to a battery, as this may result in damage.
- If setting battery aside, make sure surface is clean — free of dust, dirt, screws, etc.
- If battery is dropped, replace it even if no damage is visible.



1. Remove adhesive strips from clean battery cover.

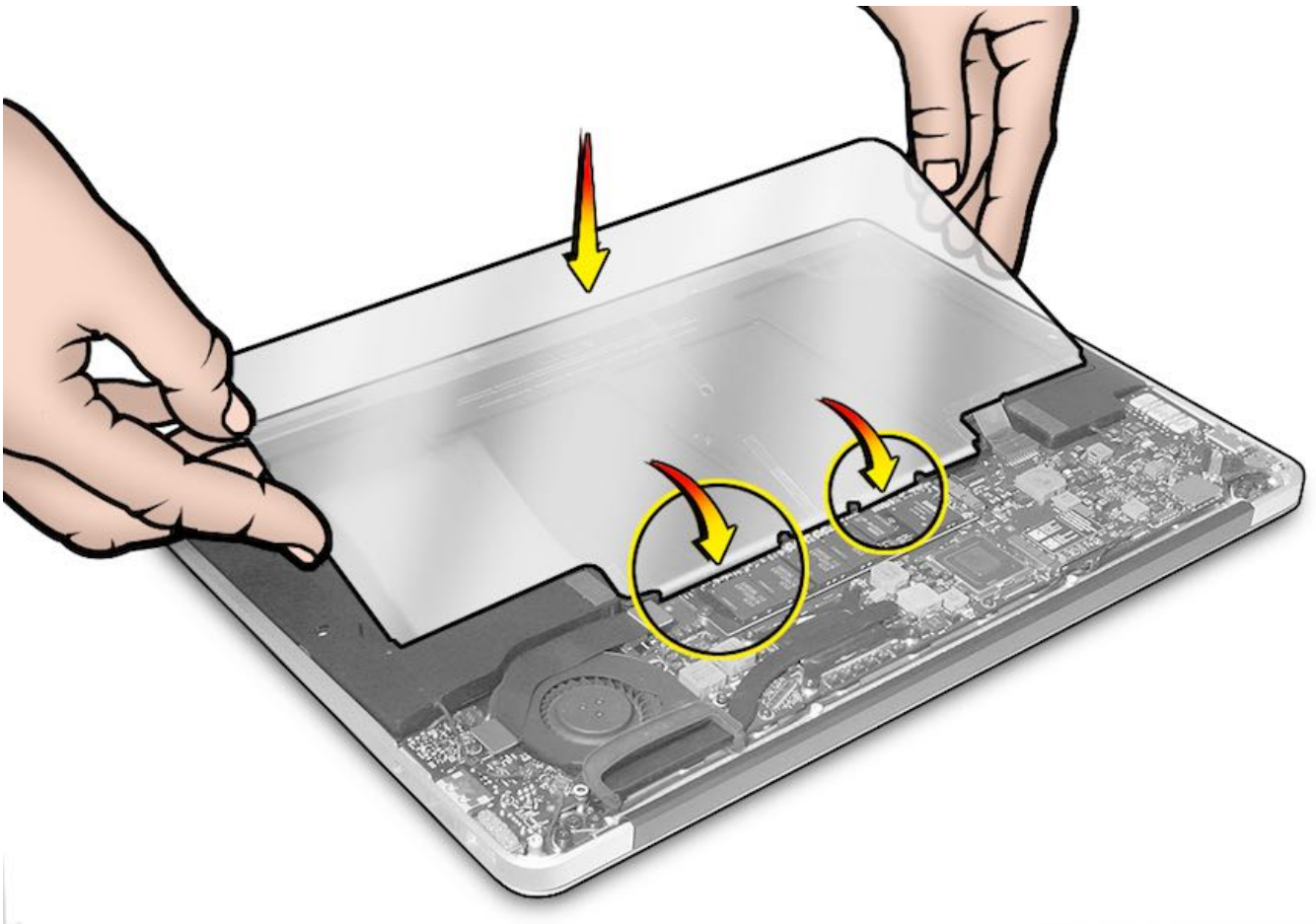


Warning: Do not perform this procedure without a clean battery cover.



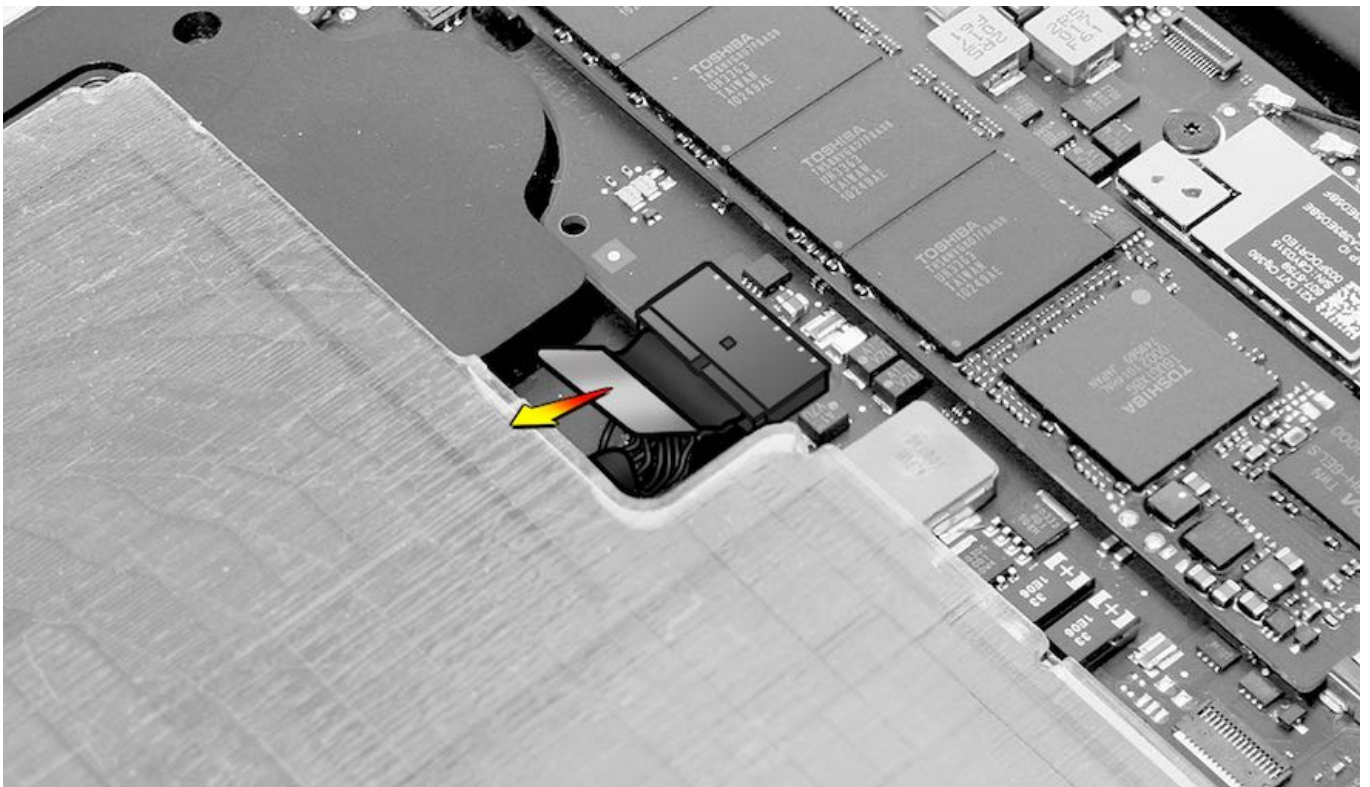
2. Using the hooks at the top of the battery cover, tilt the cover onto the battery.

3. Gently secure cover by running your finger over the parts of the cover that have adhesive.



4. Pull battery connector tab toward battery to disconnect it from logic board.

Important: Disconnect battery whenever performing repairs. There is no need to remove battery unless it blocks module being repaired.



5. Keeping screwdriver perpendicular to avoid battery damage, remove 5 Torx T5 screws; 3 long (L) and 2 short (S).

(3) 922-9654 (6.3 mm) for Late 2010 and (1) at center for Mid 2011/2012/2013 and Early 2014



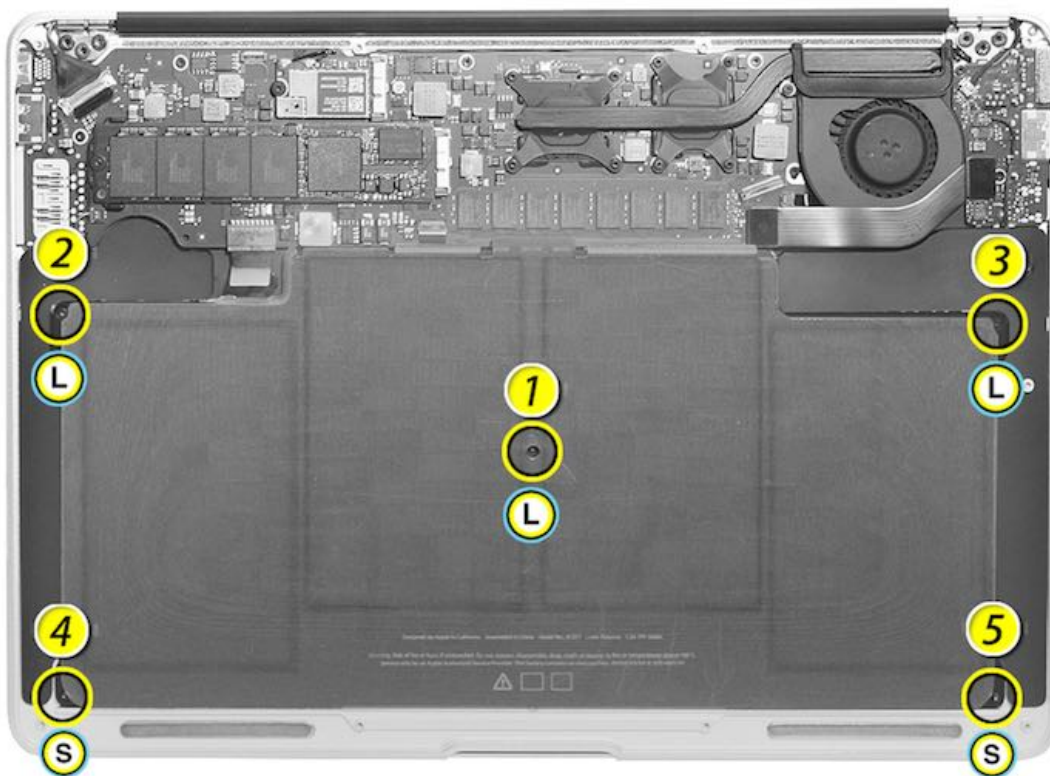
(2) 922-9969 (6.3 mm) for Mid 2011/2012/2013 and Early 2014 sides



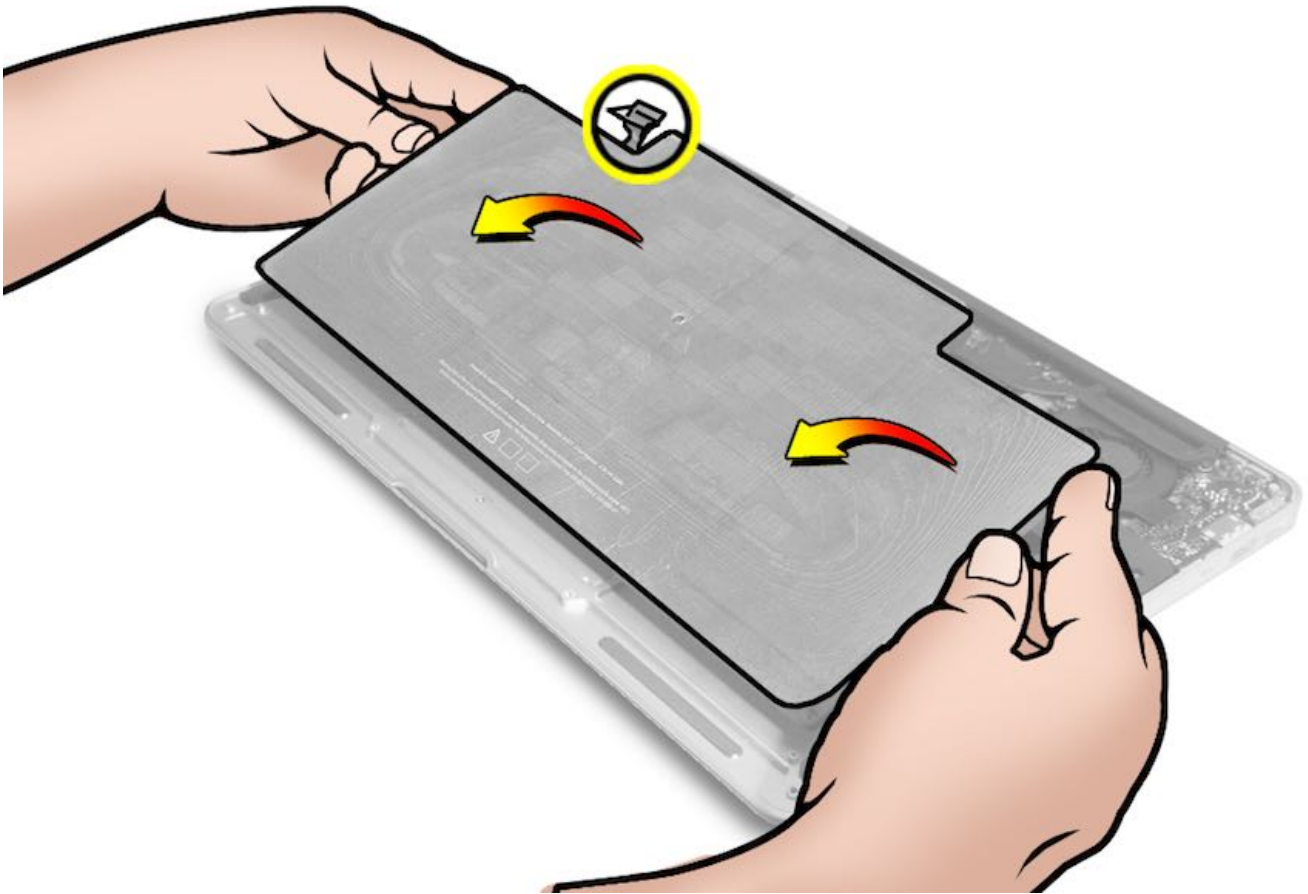
(2) 922-9655 (2.4 mm) for Late 2010, Mid 2013 and Early 2014



(2) 922-9657 (2.4 mm) for Mid 2011/2012

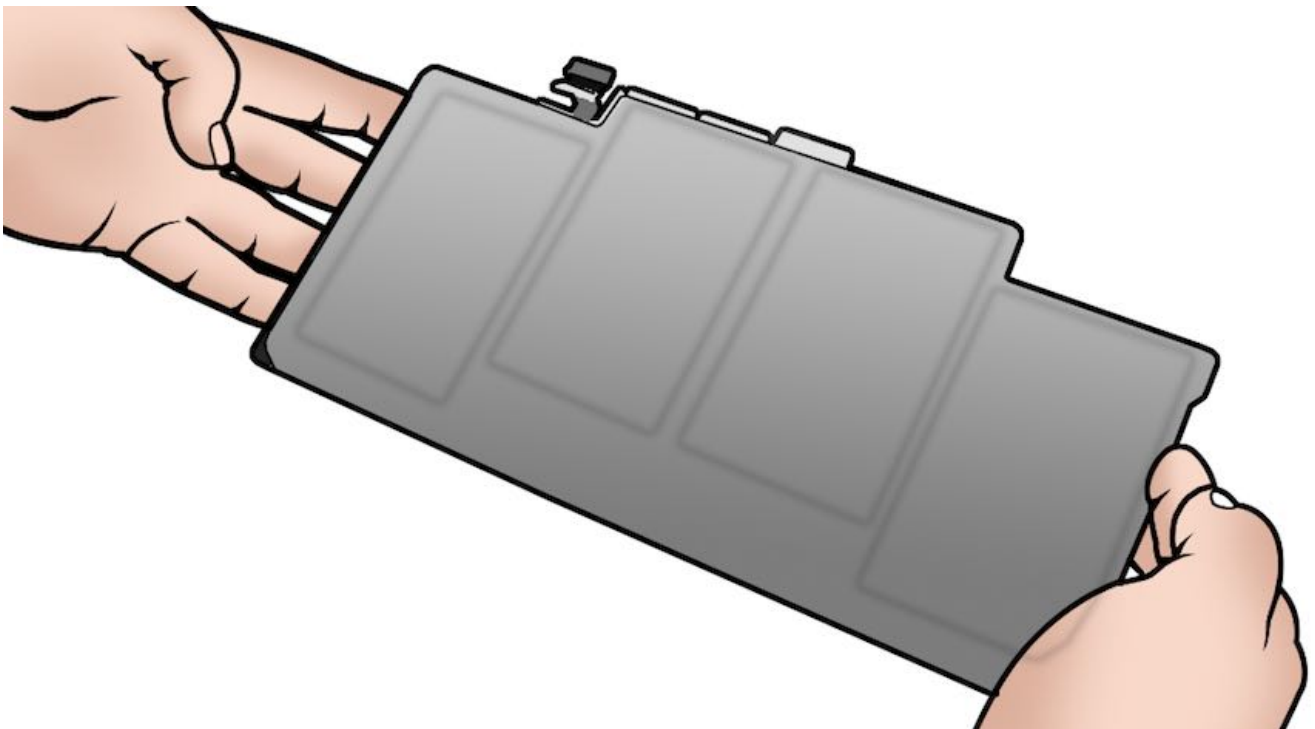


6. Handle battery by the edges only. Using battery cable, tilt covered battery out of computer.



7. Place covered battery (with cover up) on a clean surface — free of dust, dirt, screws, etc.

8. If packaging battery for return, keep battery cover installed.



Steps For Reassembly

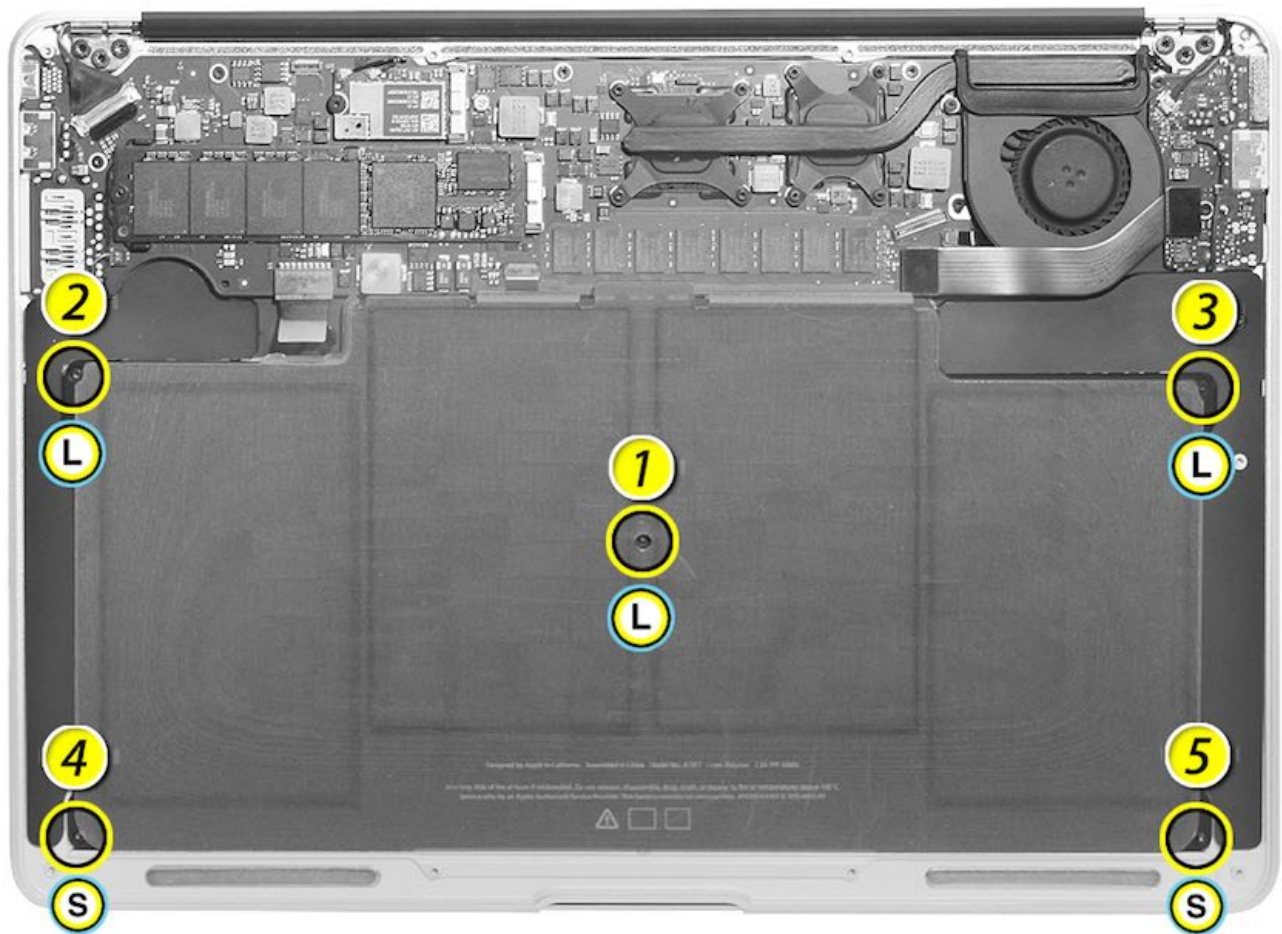
1. If installing new battery, unwrap it and make sure it has a battery cover. Do NOT use it if it does not have a cover. Contact Technical Service Provider Support for further directions.
2. Before installing the battery, check that top case is clean — free of screws or other foreign material in the battery area.
3. Use two hands to place covered battery into top case.



4. Install 5 screws in order shown (longest screw at center and rear, shortest screws in front).

Note: Use a torque driver, if available, to tighten screws to 1.8 ± 0.18 Kgf-cm. If no torque driver is available, install screws finger tight.

Important: Handle screwdriver perpendicular to the battery cover to prevent damage to the battery.

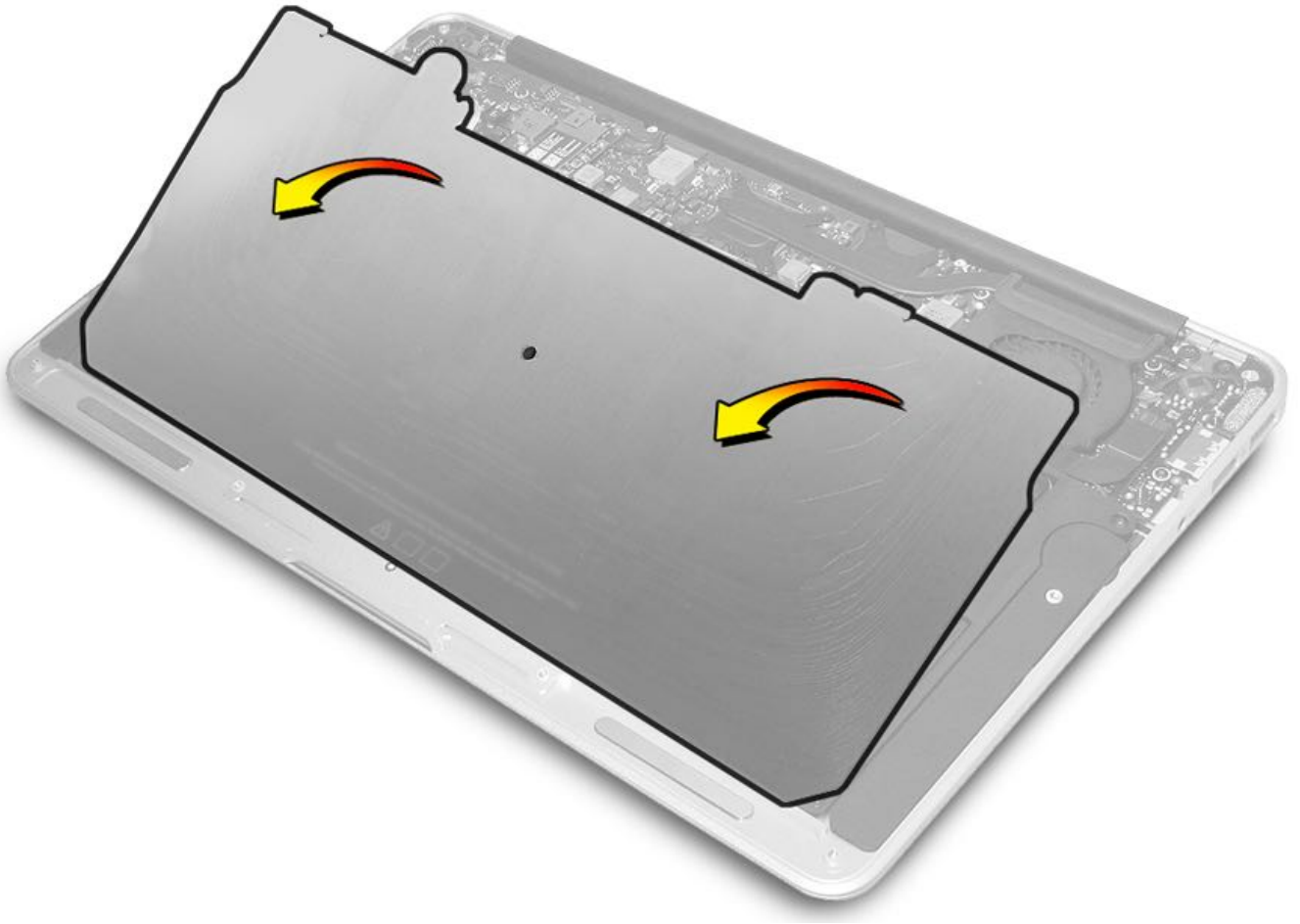


5. If performing other repairs, be sure to leave battery cable disconnected. Otherwise, connect battery cable to logic board.

6. Before installing bottom case, peel off battery cover.

Note: A clean battery cover can be reused for another repair if it is free of dust, dirt, etc.

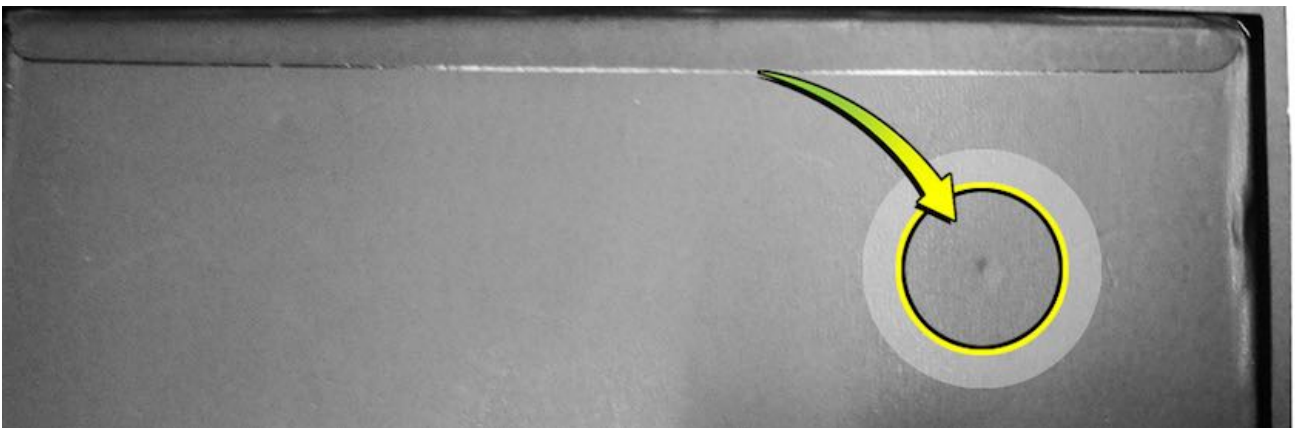
7. Visually evaluate battery for damage.



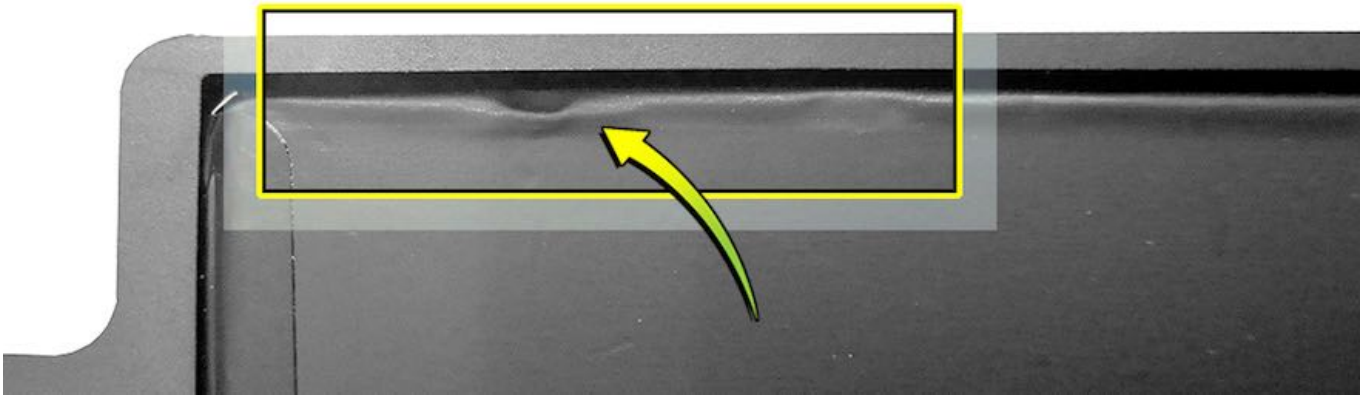
Evaluating Battery Damage

Use battery if:

- Minor dents (up to 8 dents if 0.4 mm deep or less; up to 5 if 1.5 mm deep or less; up to 3 if 2.0 mm deep or less)

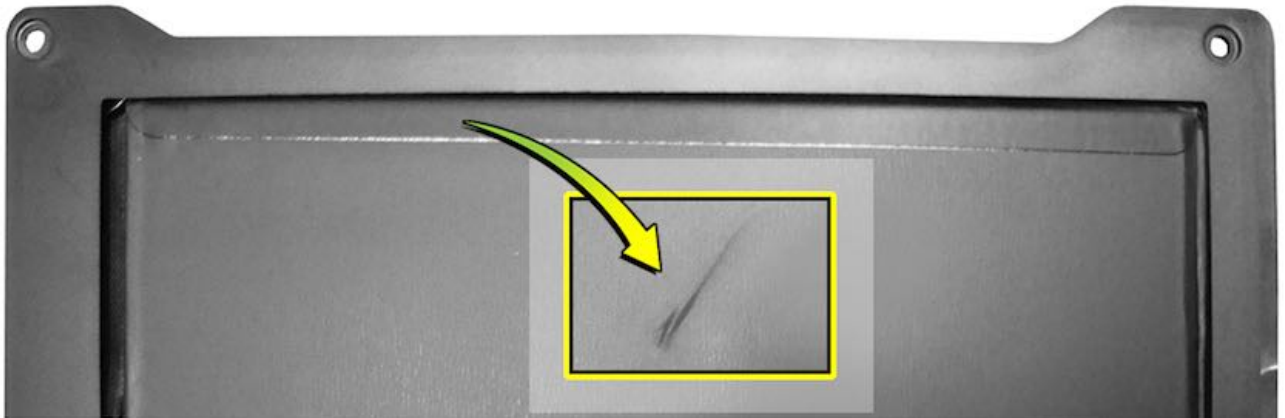


- Minor cell pack deformity (up to 2.0 mm total area)

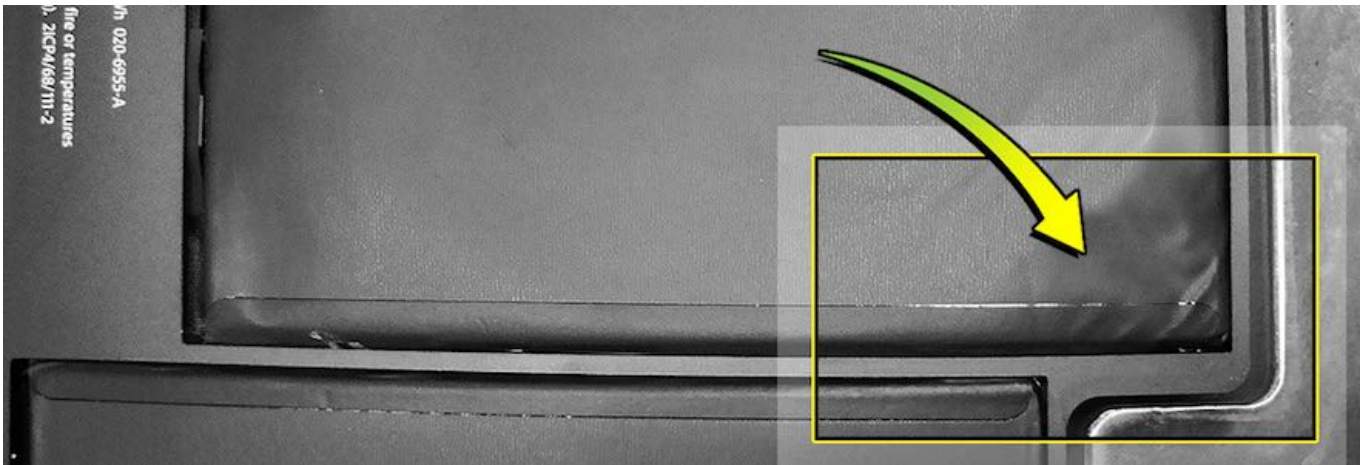


Return battery if:

- Scratches



- Swollen or wrinkled cell pack



Packing the Battery

IMPORTANT: Do not discard battery packaging!

Both the inner and outer cardboard boxes used to ship a KGB battery must be used when returning a KBB battery. Follow the packing procedure below.

If either box has been damaged or lost, order a replacement service package (606-0090). The service package includes both the inner and outer cardboard boxes and an ESD bag. Reuse the battery cover that was included with the KGB battery or, if a new cover is needed, order part 922-9735.

1. Place protective cover on battery.



2. Place covered battery inside ESD bag.

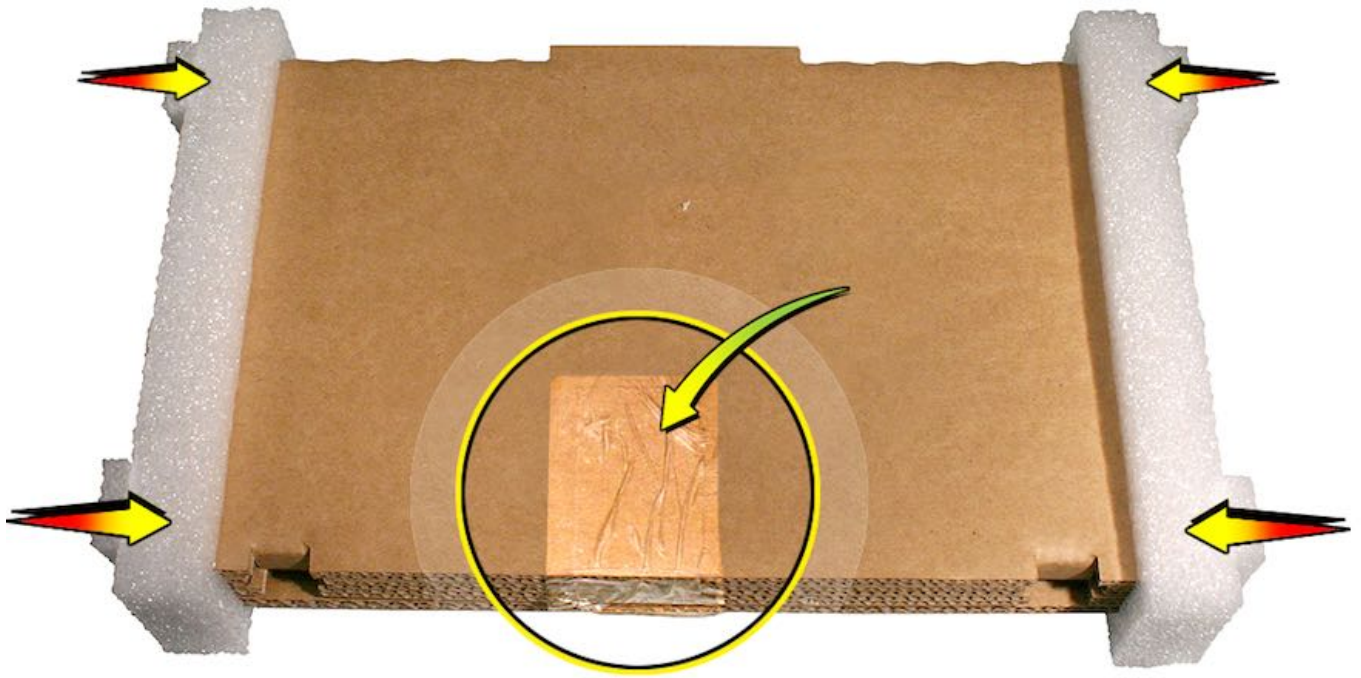


3. Carefully place covered and wrapped battery in cardboard packing material.



4. Close inner box. Attach foam end pieces on box and tape the box closed.

Note: The packing MUST be taped closed. Any tape will work. Do not use staples, as they can puncture the battery.



5. Carefully place taped box into shipping box.

6. Close box and return battery using normal shipping procedures.

Note: As with shipping any battery, IATA compliance is a must. See Apple Support article [HT3378: Air Shipment Regulations for Lithium-Based Batteries](#).



MacBook Air (13-inch, Late 2010): Right Speaker

First Steps

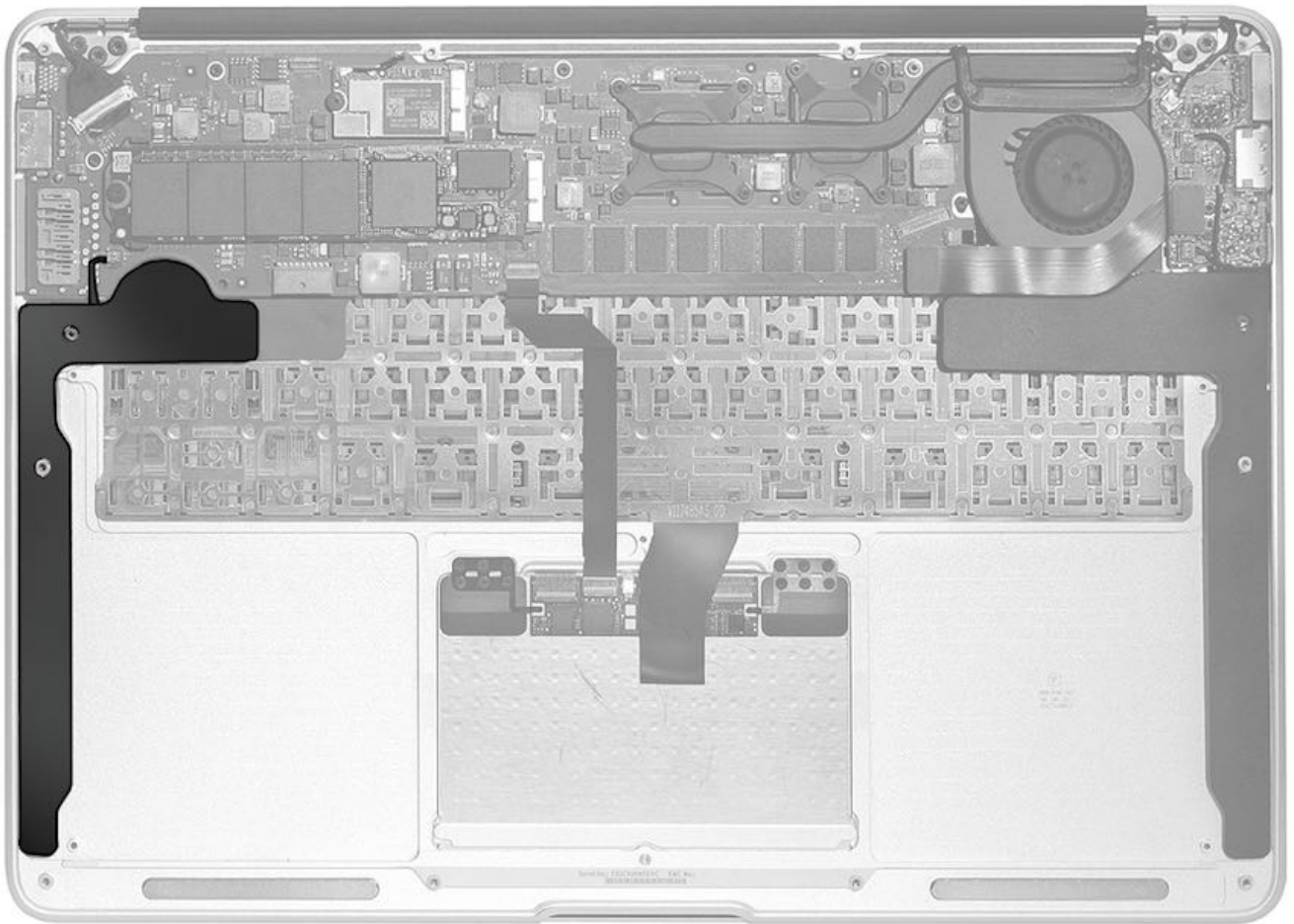
Remove:

- [Bottom Case](#)
- [Battery](#)



Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



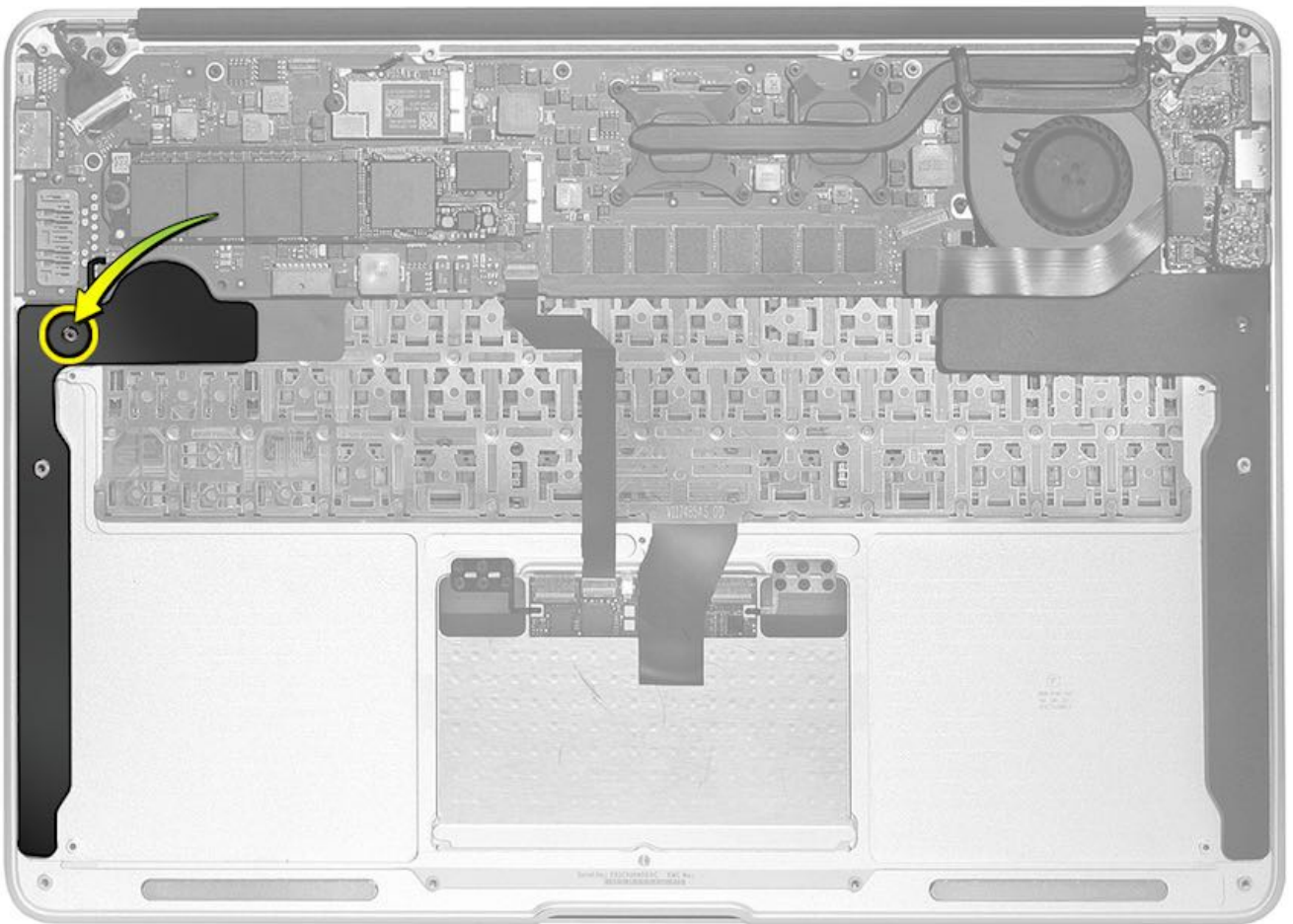
Tools

- ESD wrist strap
- Torx T5 screwdriver, magnetized
- Black stick

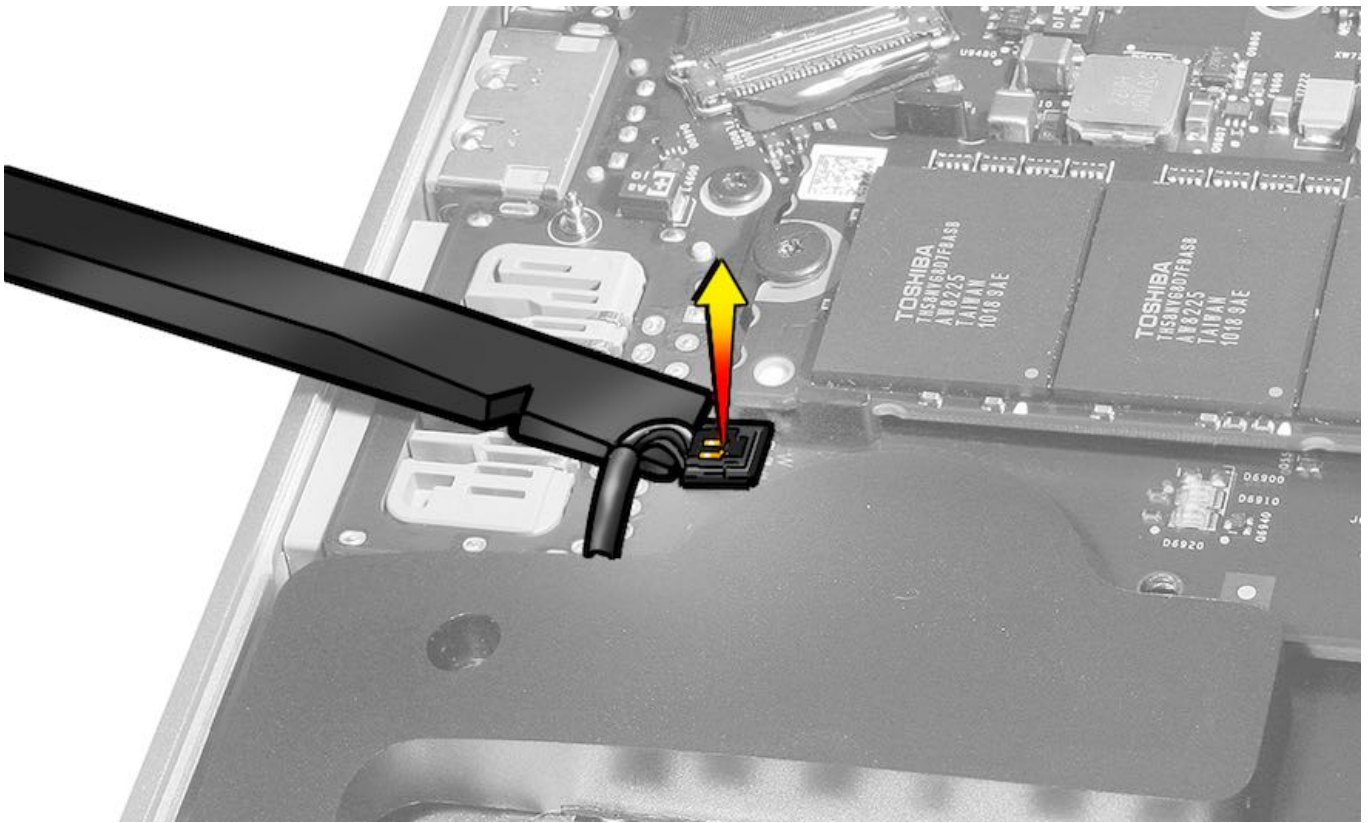


Steps For Removal

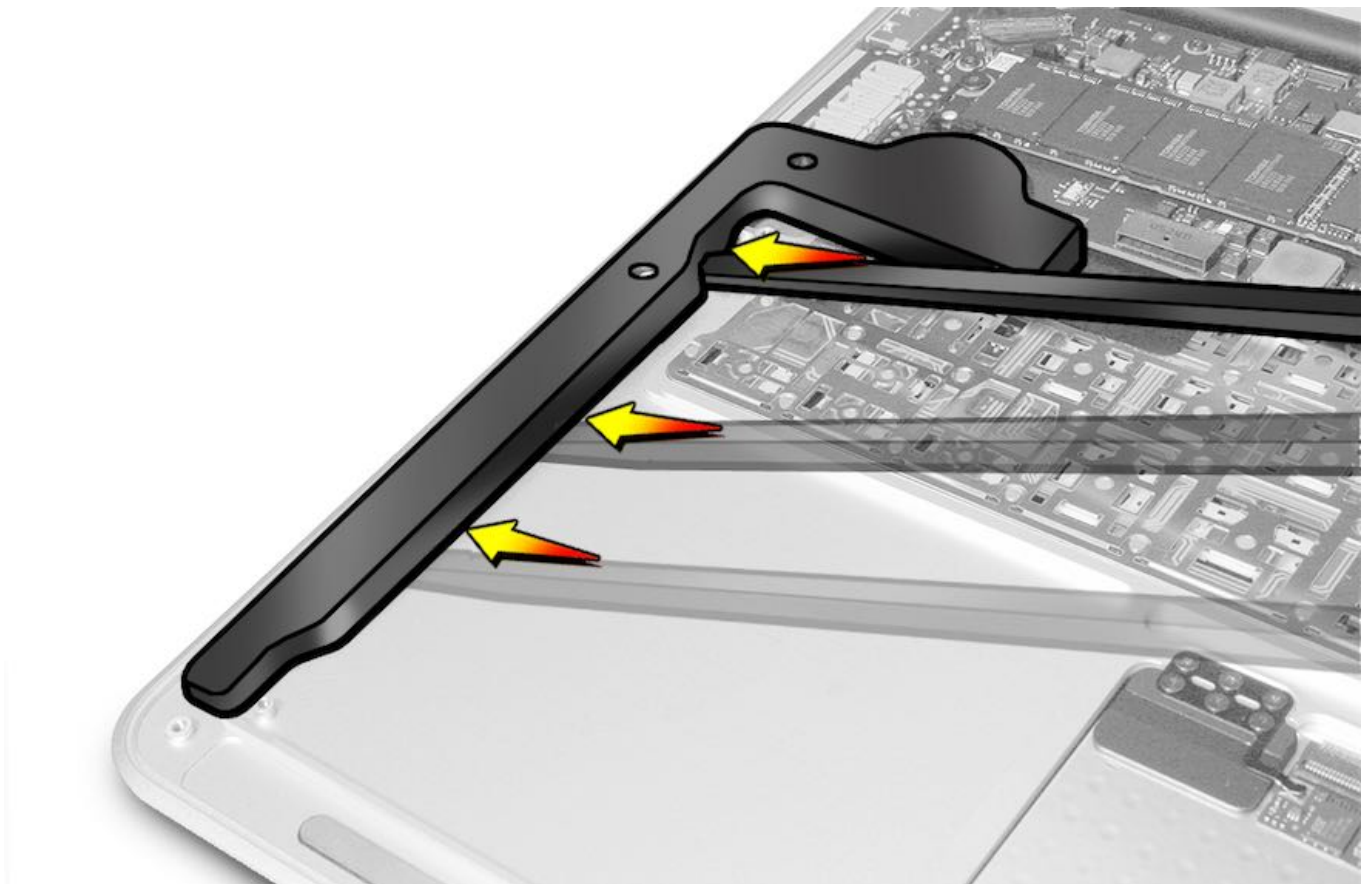
1. Remove one Torx #5 screw: 922-9660 (2.7 mm)



2. Use black stick to disconnect vertical insertion cable from logic board.



3. Use black stick to pry very high bond (VHB) adhesive securing speaker to top case.



Steps For Reassembly

1. Make sure top case is free of residual VHB adhesive if installing new speaker.
2. Peel adhesive backing off speaker body and install speaker into top case.
3. Apply some pressure to make sure speaker adheres to top case.
4. Connect cable and replace screw.

MacBook Air (13-inch, Mid 2011, Mid 2012, Mid 2013, Early 2014): Right Speaker

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV161: Right Speaker Replacement Video](#).

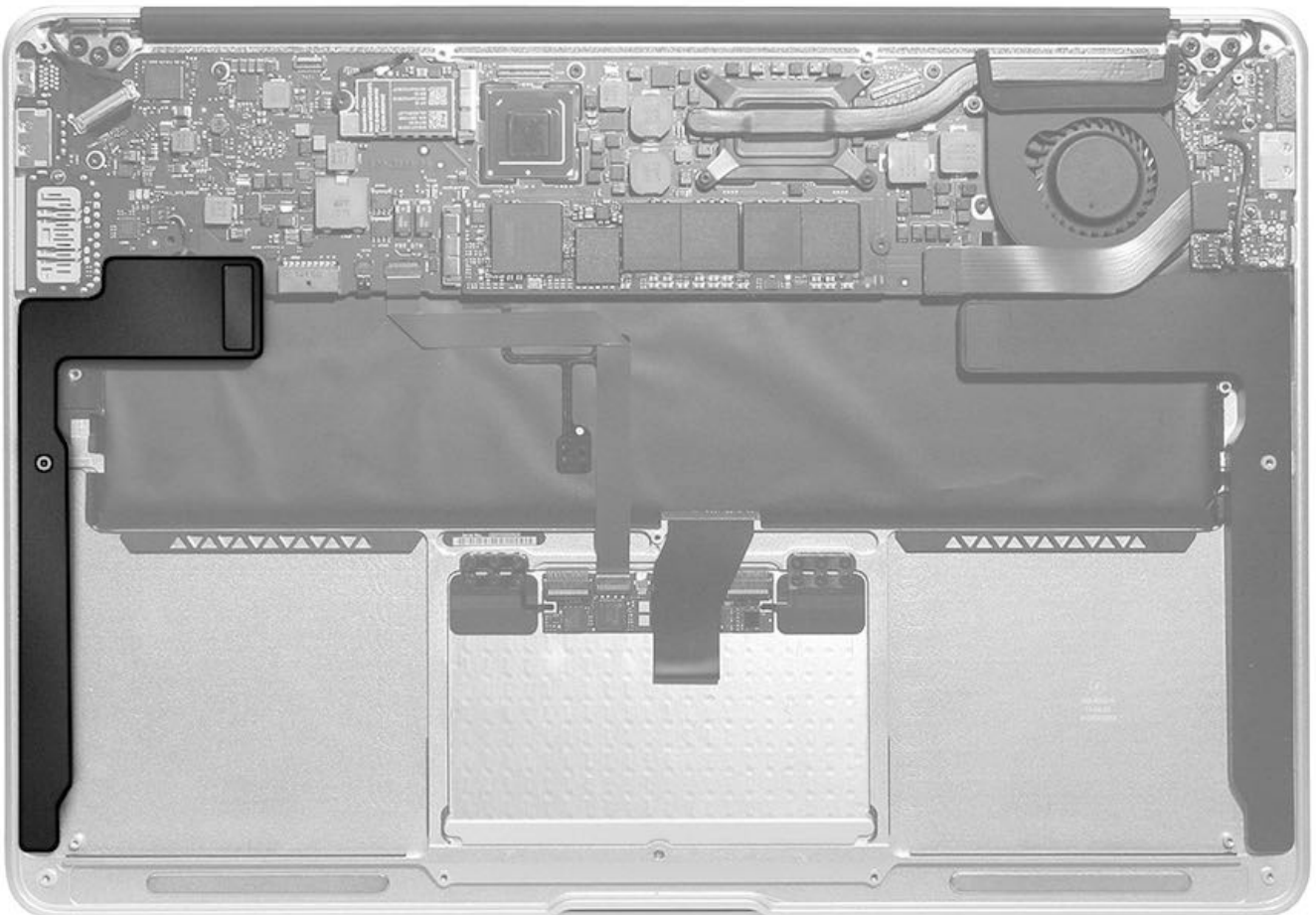
Remove:

- [Bottom Case](#)
- [Battery](#)



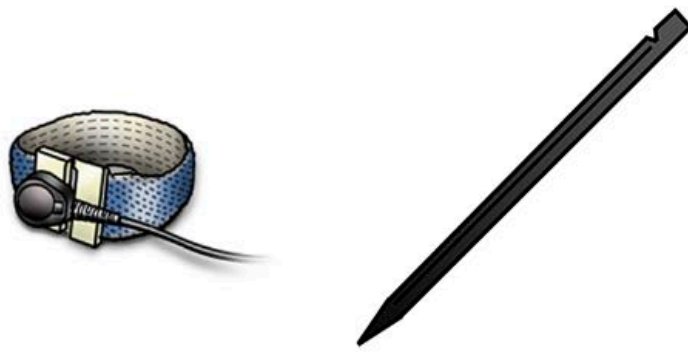
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

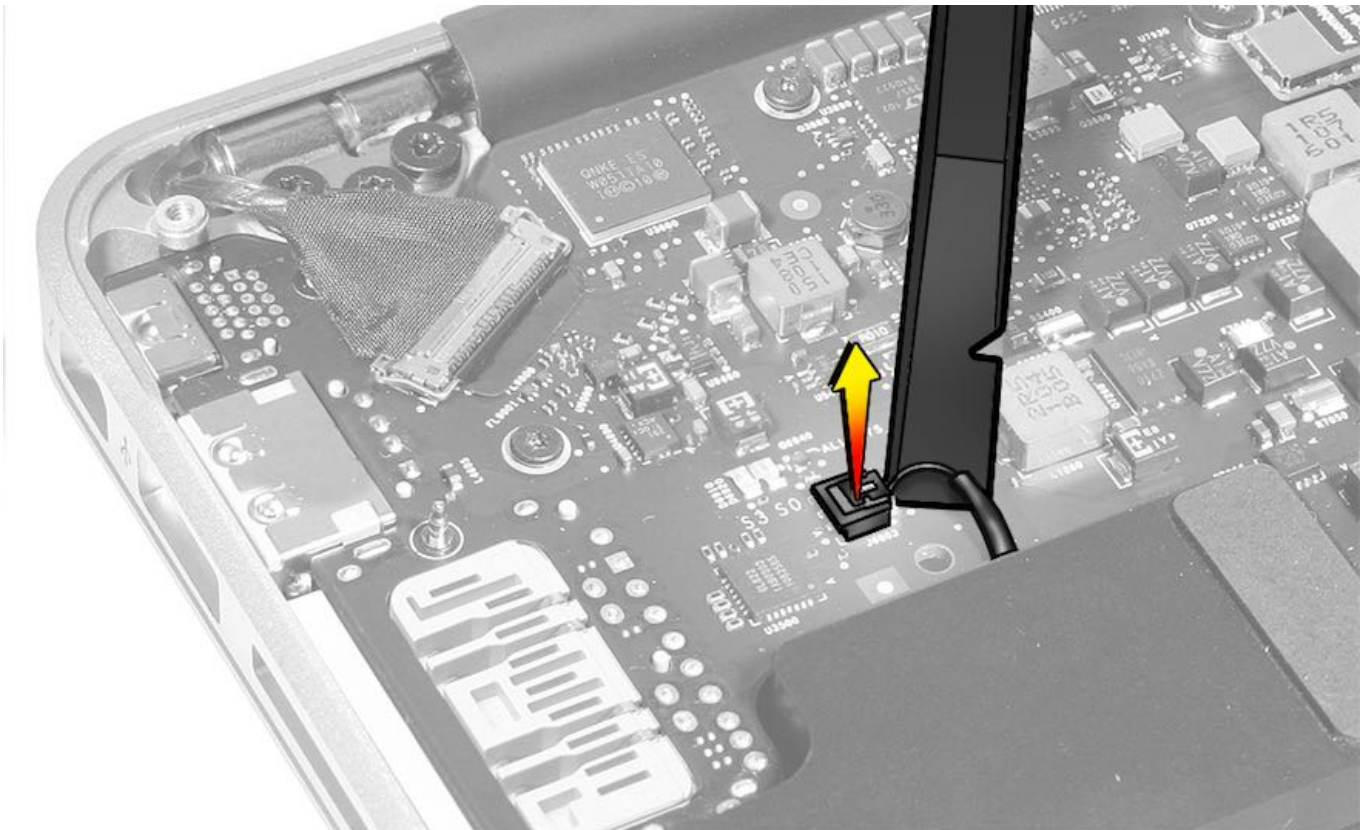
- ESD wrist strap
- Black stick



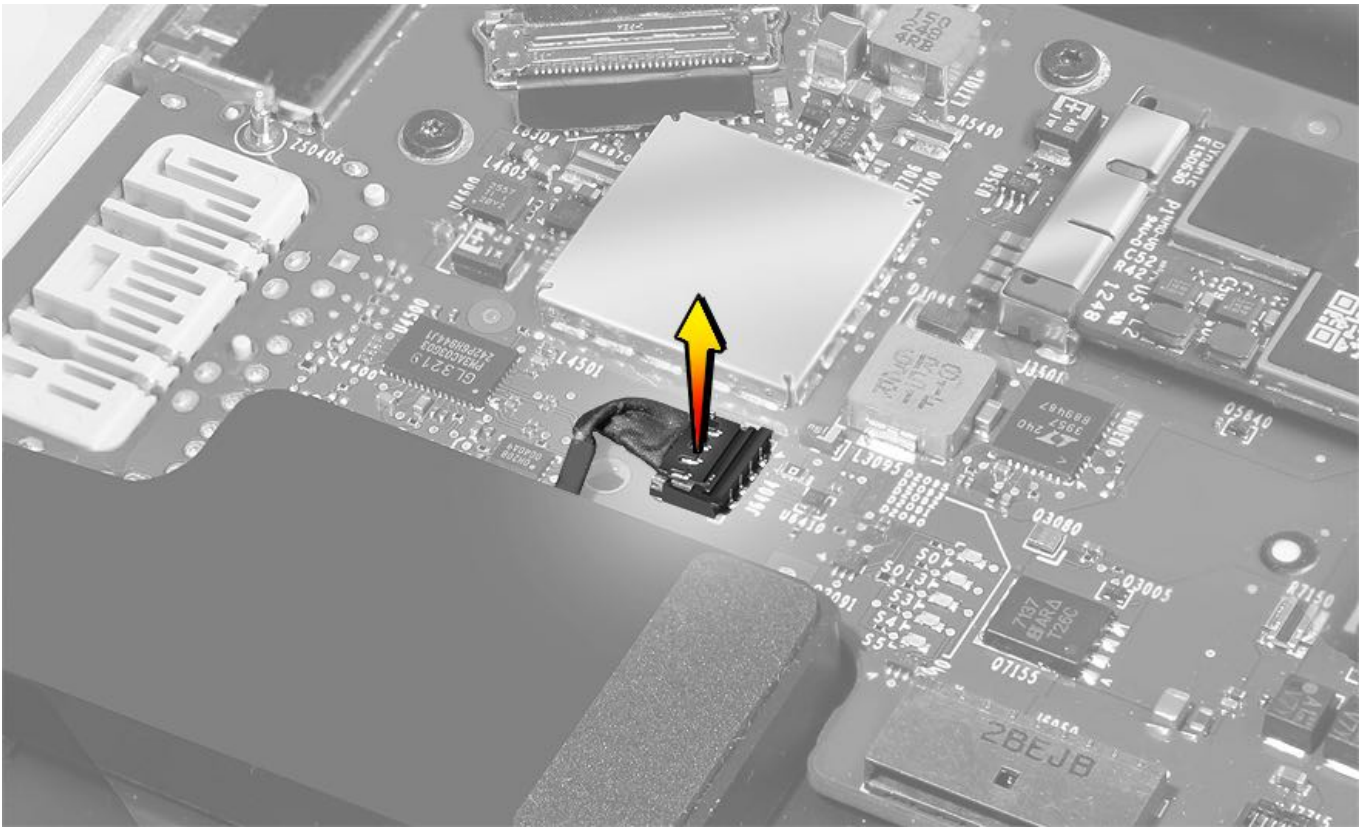
Steps For Removal

1. Use black stick to disconnect vertical interior cable from logic board.

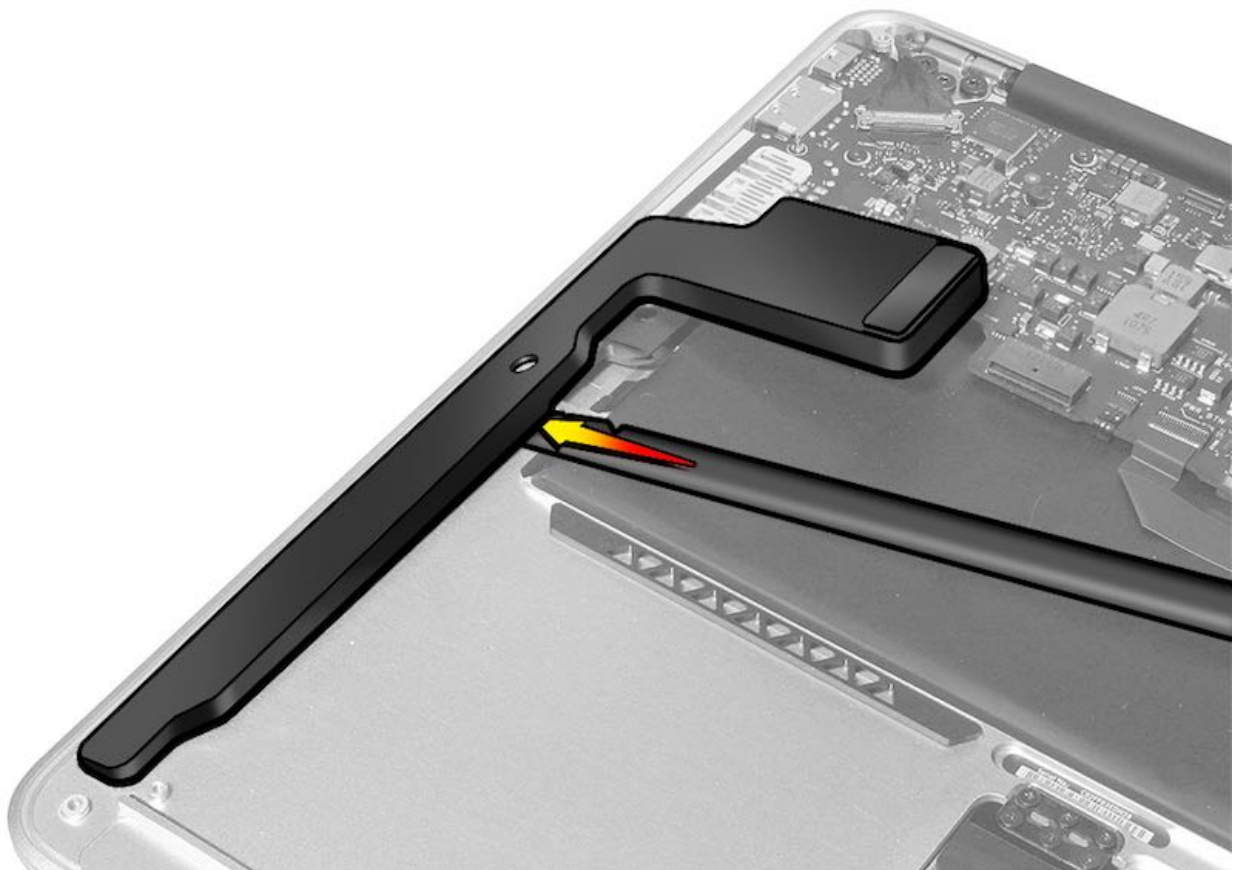
MacBook Air (13-inch, Mid 2011 and Mid 2012)



MacBook Air (13-inch, Mid 2013 and Early 2014)



2. Use black stick to pry very high bond (VHB) adhesive securing speaker to top case.



Steps For Reassembly

1. Make sure top case is free of residual VHB adhesive if installing new speaker.
2. Peel adhesive backing off speaker body and install speaker into top case.
3. Apply some pressure to make sure speaker adheres to top case.
4. Connect cable and replace screw.

MacBook Air (13-inch, Late 2010): Left Speaker

First Steps

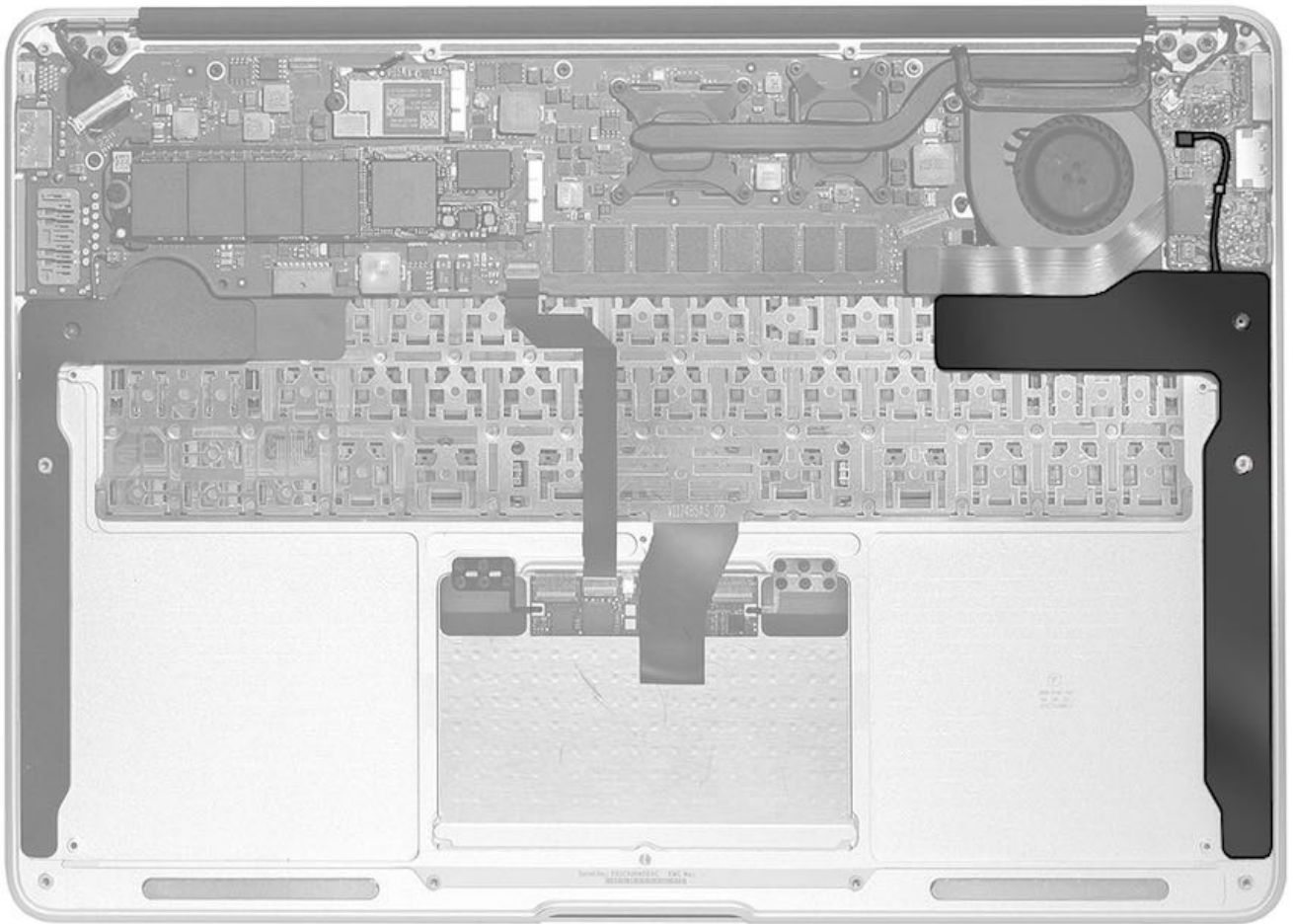
Remove:

- [Bottom Case](#)
- [Battery](#)



Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



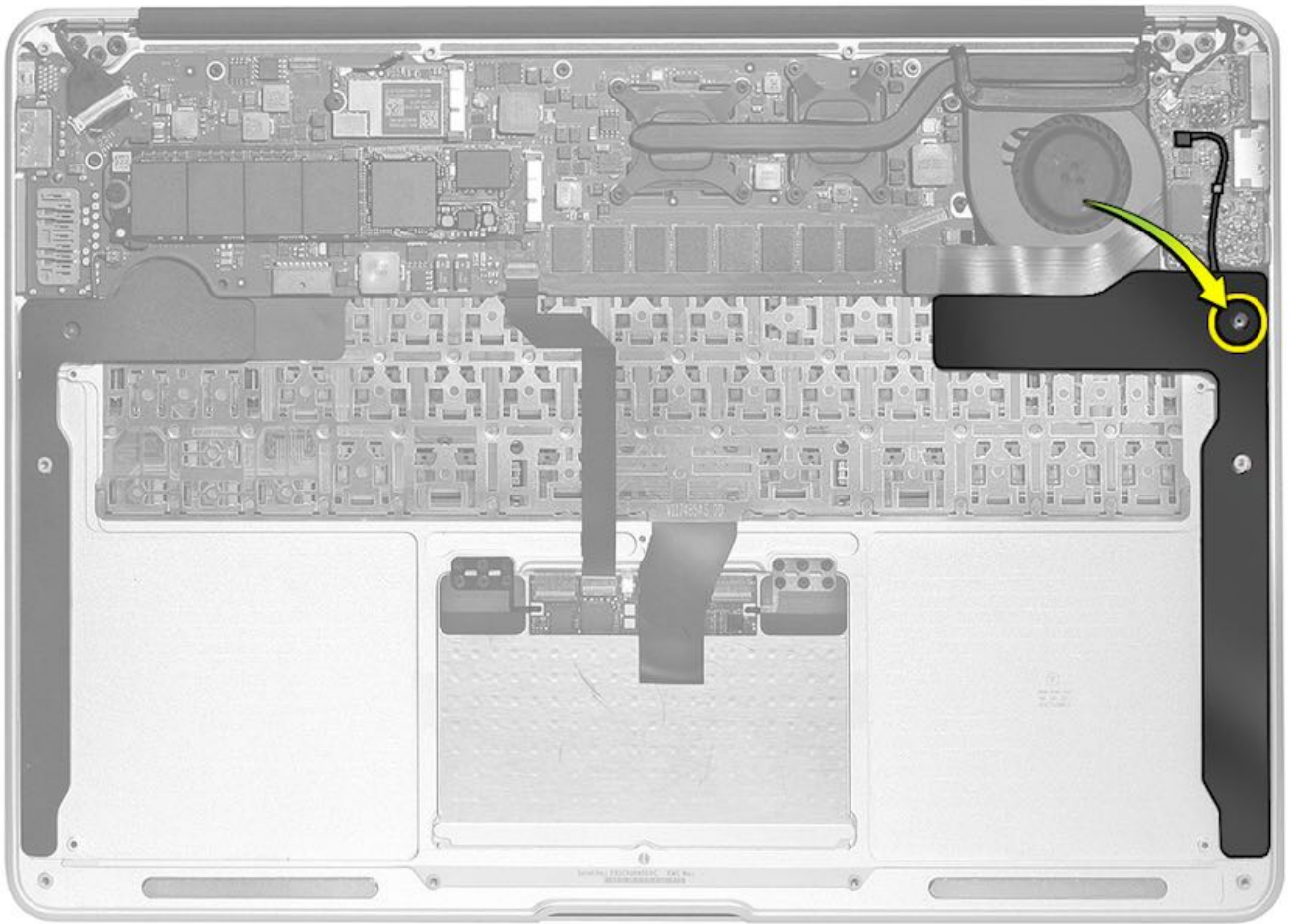
Tools

- ESD wrist strap
- Torx T5 screwdriver, magnetized
- Black stick



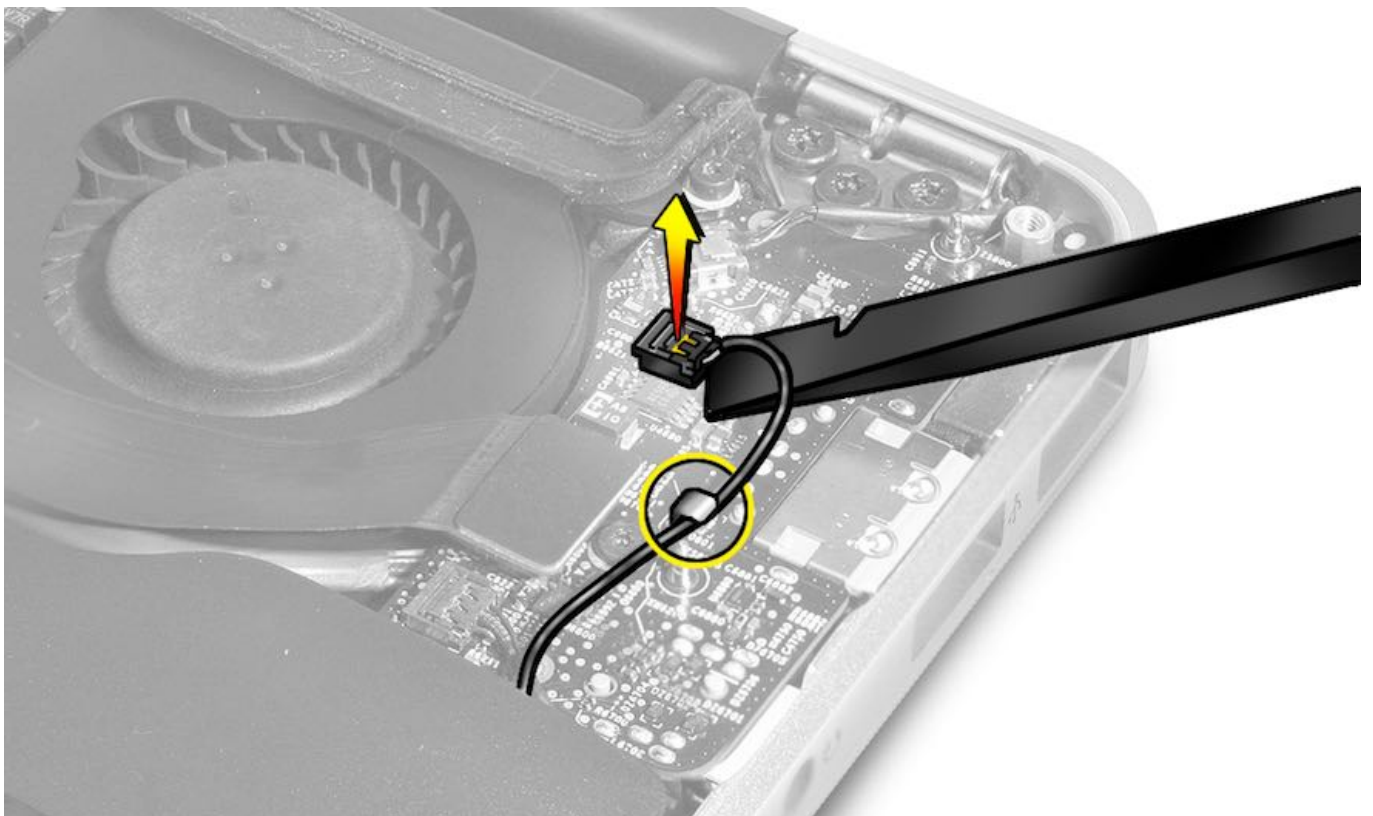
Steps For Removal

1. Remove one Torx #5 screw: 922-9660 (2.7 mm)



2. Use black stick to disconnect vertical insertion cable from I/O board.

3. Release speaker cable from clip.



4. Use black stick to pry very high bond (VHB) adhesive securing speaker to top case.



Steps For Reassembly

Important: When placing a new speaker into an existing top case, make sure the top case is clean and free of any residual adhesive or debris. Use only the adhesive preinstalled on the new speaker. **The adhesive must lie flat in a single layer.** Do not double up speaker/top case adhesive.

Note: If installing a new or existing speaker in a new top case, see Important note in [Top Case](#) procedure.

1. Make sure top case is free of residual VHB adhesive if installing new speaker.
2. Peel adhesive backing off speaker body and install speaker into top case.
3. Apply some pressure to make sure speaker adheres to top case.
4. Route cable under retaining clip and connect cable I/O board.
5. Replace screw.

MacBook Air (13-inch, Mid 2011, Mid 2012, Mid 2013, Early 2014): Left Speaker

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV162: Left Speaker Replacement Video](#).

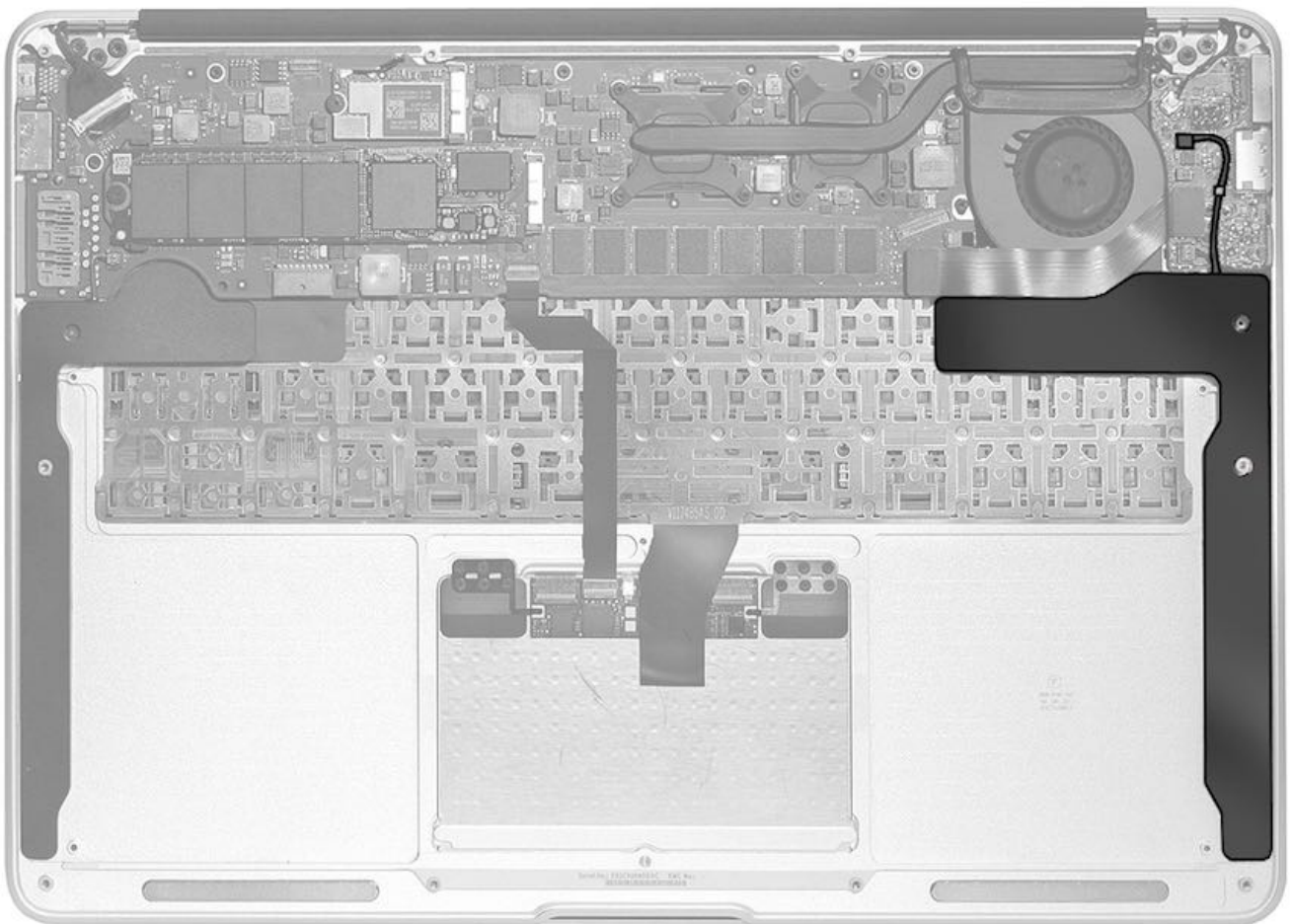
Remove:

- [Bottom Case](#)
- [Battery](#)



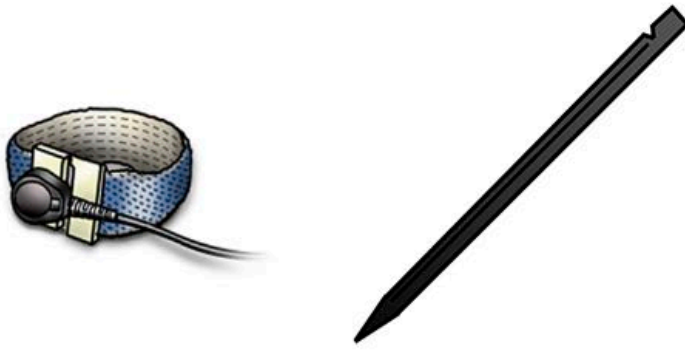
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



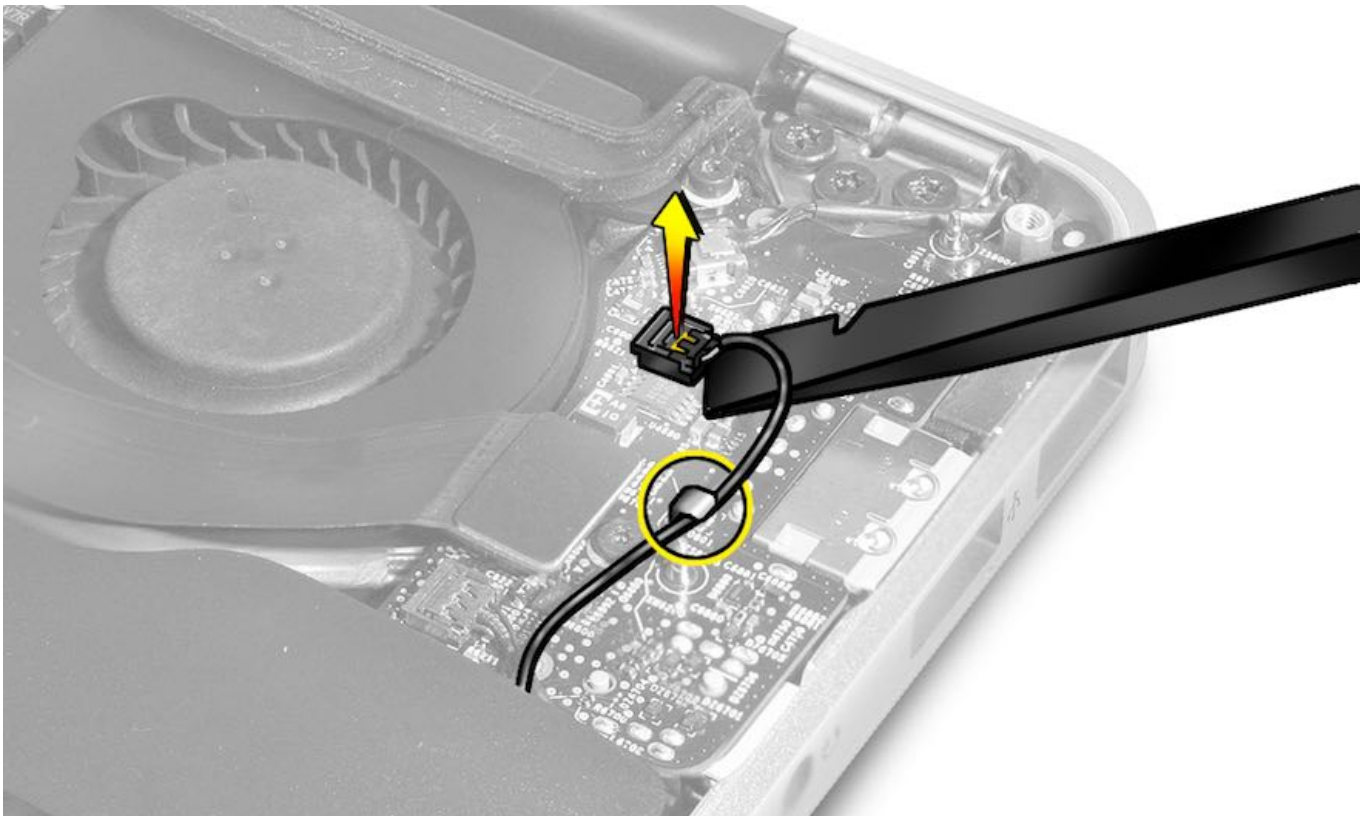
Tools

- ESD wrist strap
- Black stick



Steps For Removal

1. Use black stick to disconnect vertical insertion cable from I/O board.
2. Release speaker cable from clip, if present.



3. Use black stick to pry very high bond (VHB) adhesive securing speaker to top case.



Steps For Reassembly

Important: Use only the adhesive preinstalled on the new speaker. **The adhesive must lie flat in a single layer.** Do not double up speaker/top case adhesive.

Note: If installing a new or existing speaker in a new top case, see Important note in [Top Case](#) procedure.

1. Make sure top case is free of residual VHB adhesive if installing new speaker.
2. Peel adhesive backing off speaker body and install speaker into top case.
3. Apply some pressure to make sure speaker adheres to top case.
4. Route cable under retaining clip, if present, and connect cable I/O board.

MacBook Air (13-inch, Late 2010): Solid State Drive (SSD) Card

First Steps

Remove:

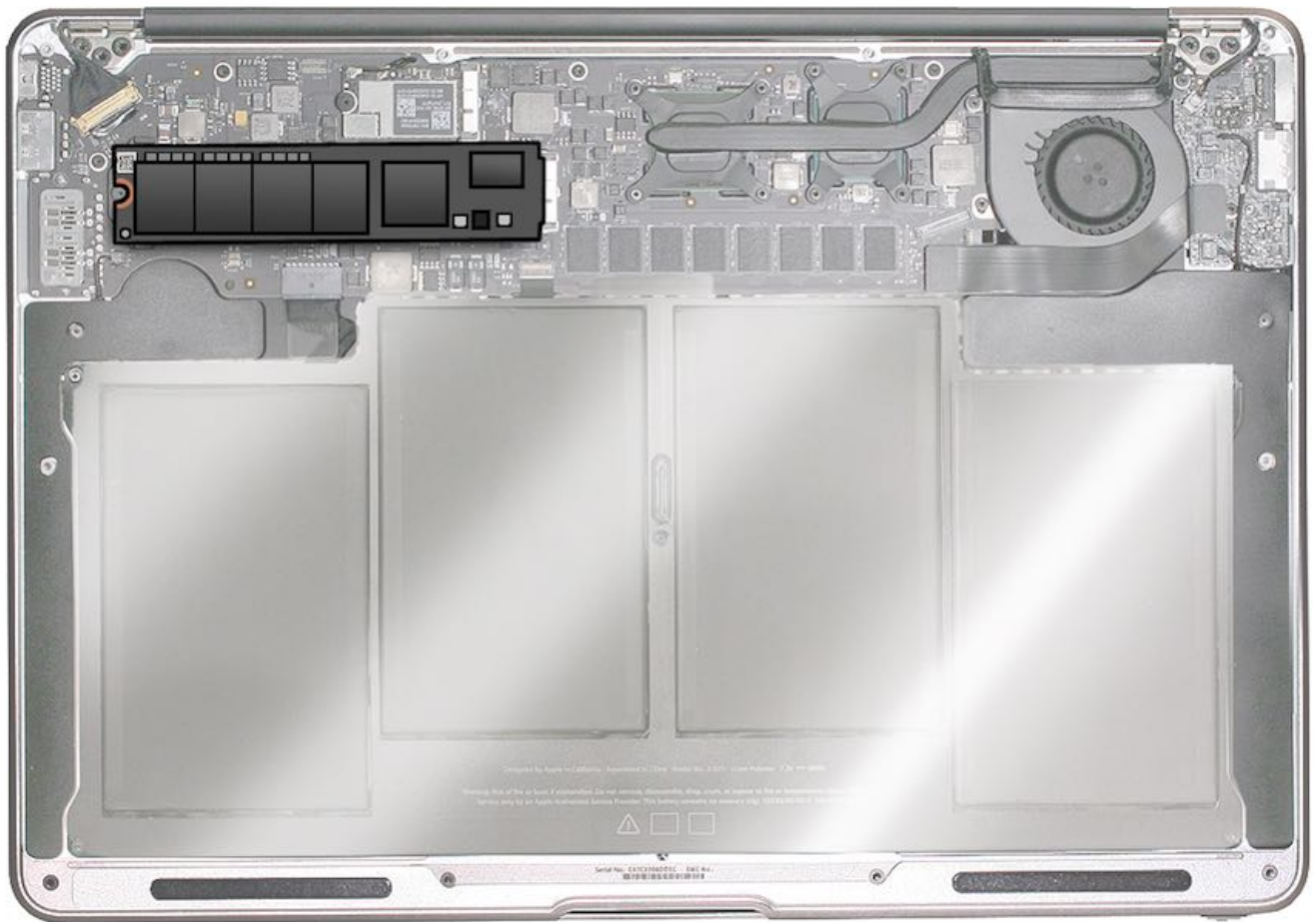
- [Bottom Case](#)



Important: Always attach the battery cover immediately after removing the bottom case.

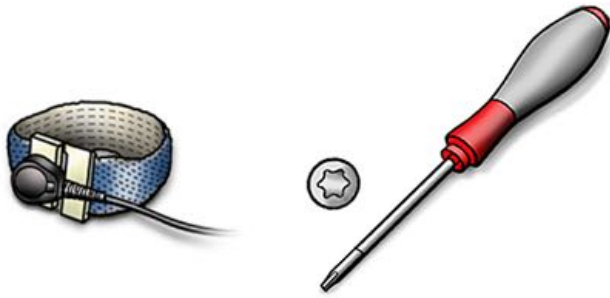
Caution: Read [Battery Safety Precautions](#) before performing this procedure.

Caution: Make sure data is backed up before removing solid state drive.



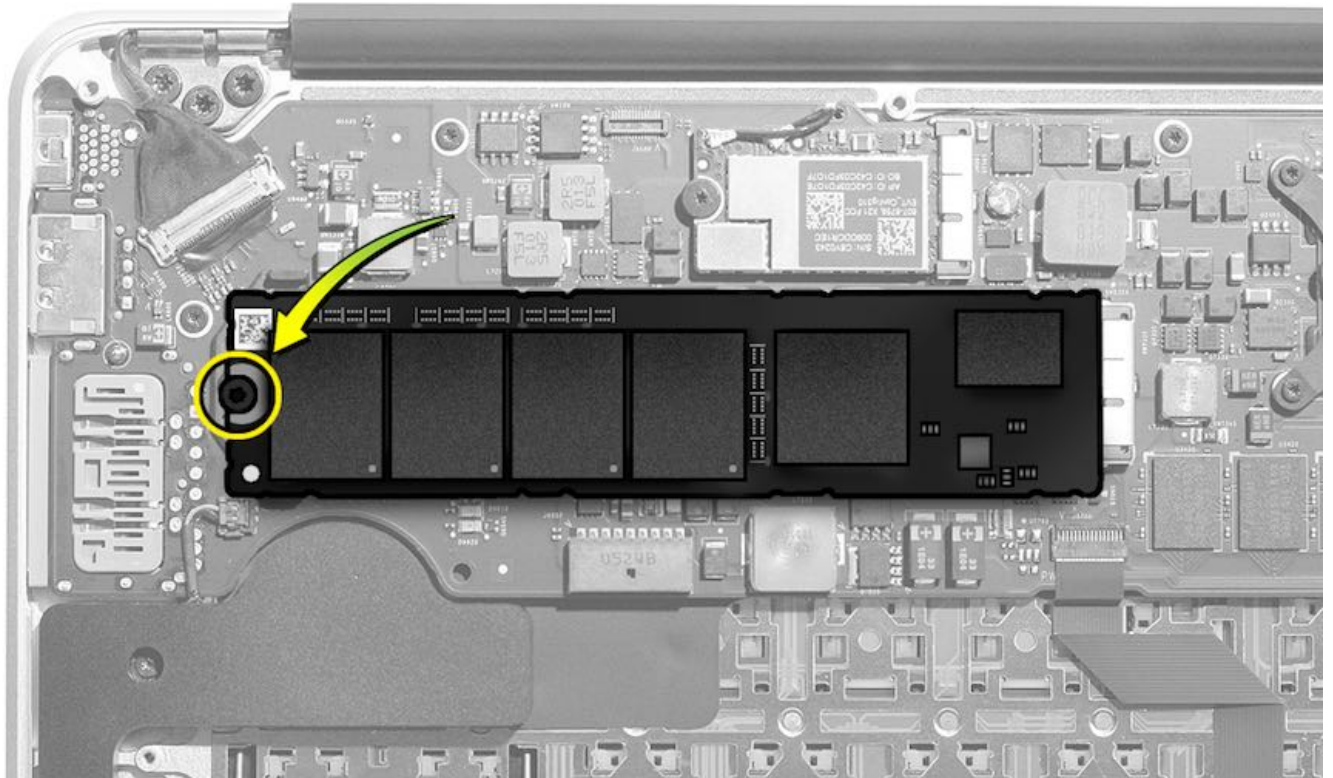
Tools

- ESD wrist strap
- Torx T5 screwdriver, magnetized



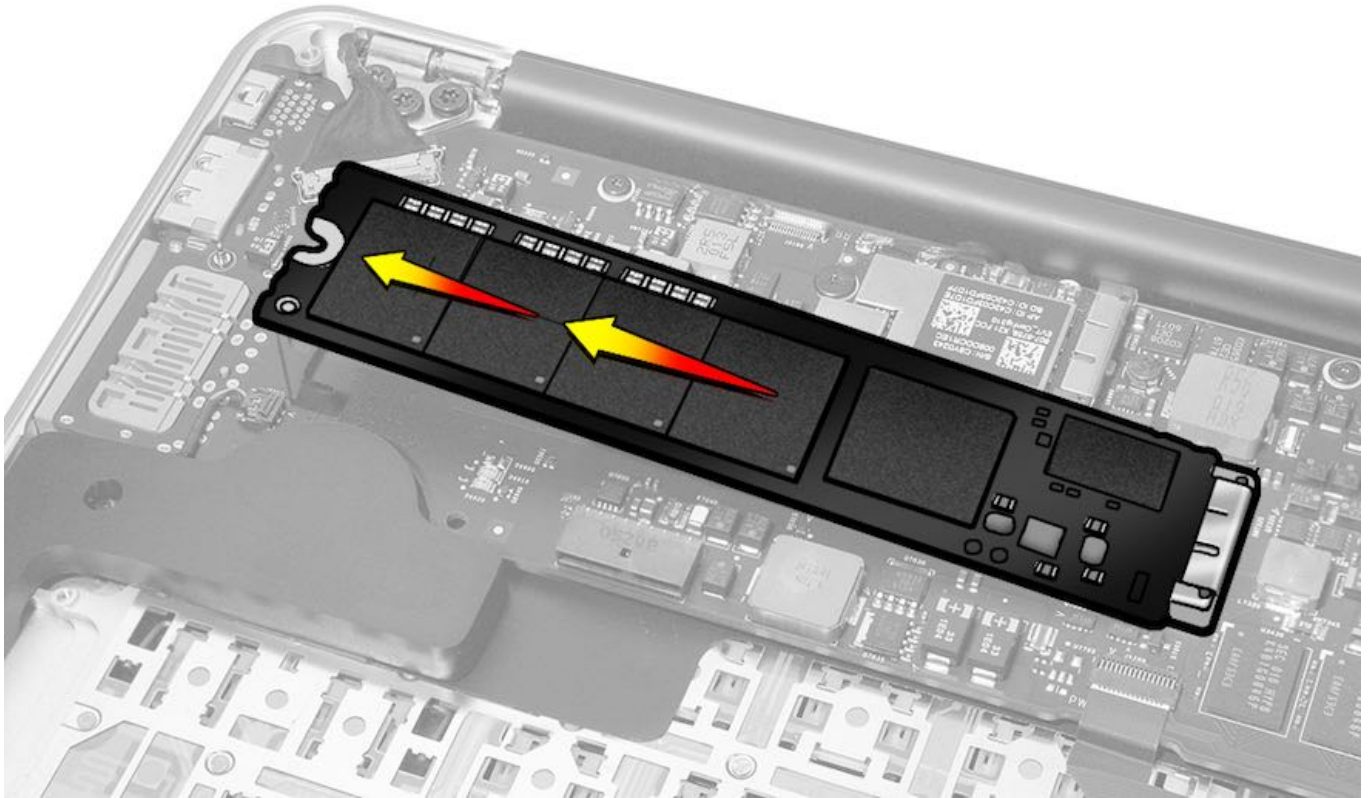
Steps For Removal

1. Remove one Torx #5 screw: 922-9651 (2.85 mm)



2. Tilt up SSD card at a slight angle (< 3 degrees) and gently pull it to disconnect it from logic board.

Reassembly Note: Push SSD card securely into slot confirming that it is seated properly.



Steps For Reassembly

IMPORTANT: Check the following charts before ordering a replacement SSD card. **Parts must be replaced like-for-like (same vendor, same capacity).**

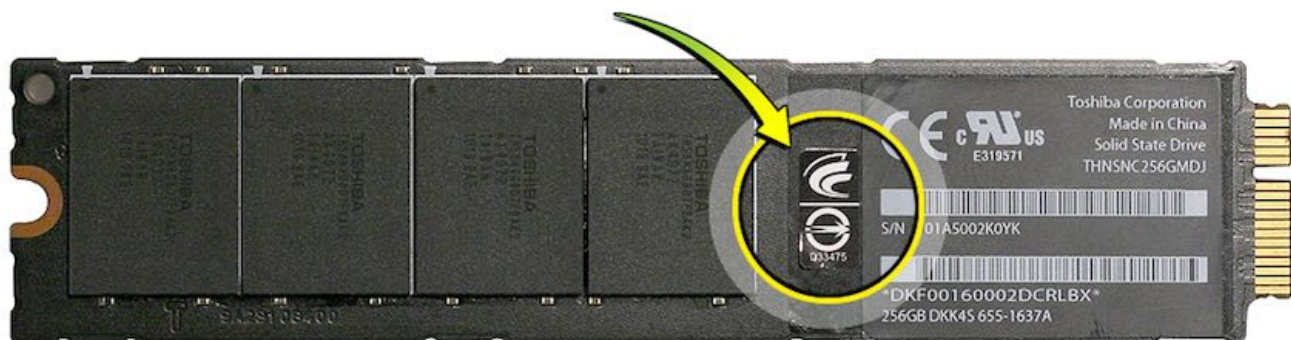
Samsung SSD	Part Number
128 GB	661-5683
256 GB	661-5684

Toshiba SSD	Part Number
128 GB	661-6646
256 GB	661-6647

Verify the SSD vendor name by either of these methods:

- Check the label on the SSD card.
- Check the drive listed in About This Mac > System Report > Serial ATA where "Apple SSD SMxxxE" is Samsung; "Apple SSD TSxxxC" is Toshiba; and xxx is the capacity of the device (128GB/256GB)

Replacement Note: Locate and remove the compliance label from a new SSD card before installing it in the computer.



Toshiba Corporation
Made in China
Solid State Drive
THNSNC256GMDJ

CE c RoHS US
E319571

S/N 01A5002K0YK

DKF00160002DCRLBX*

256GB DKK4S 655-1637A

MacBook Air (13-inch, Mid 2011, Mid 2012, Mid 2013, Early 2014): Solid State Drive (SSD) Card or Flash Storage

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV170: Flash Storage Replacement Video](#) (Mid 2012) and [SV153: Flash Storage Replacement Video](#) (Mid 2013 and Early 2014).

Remove:

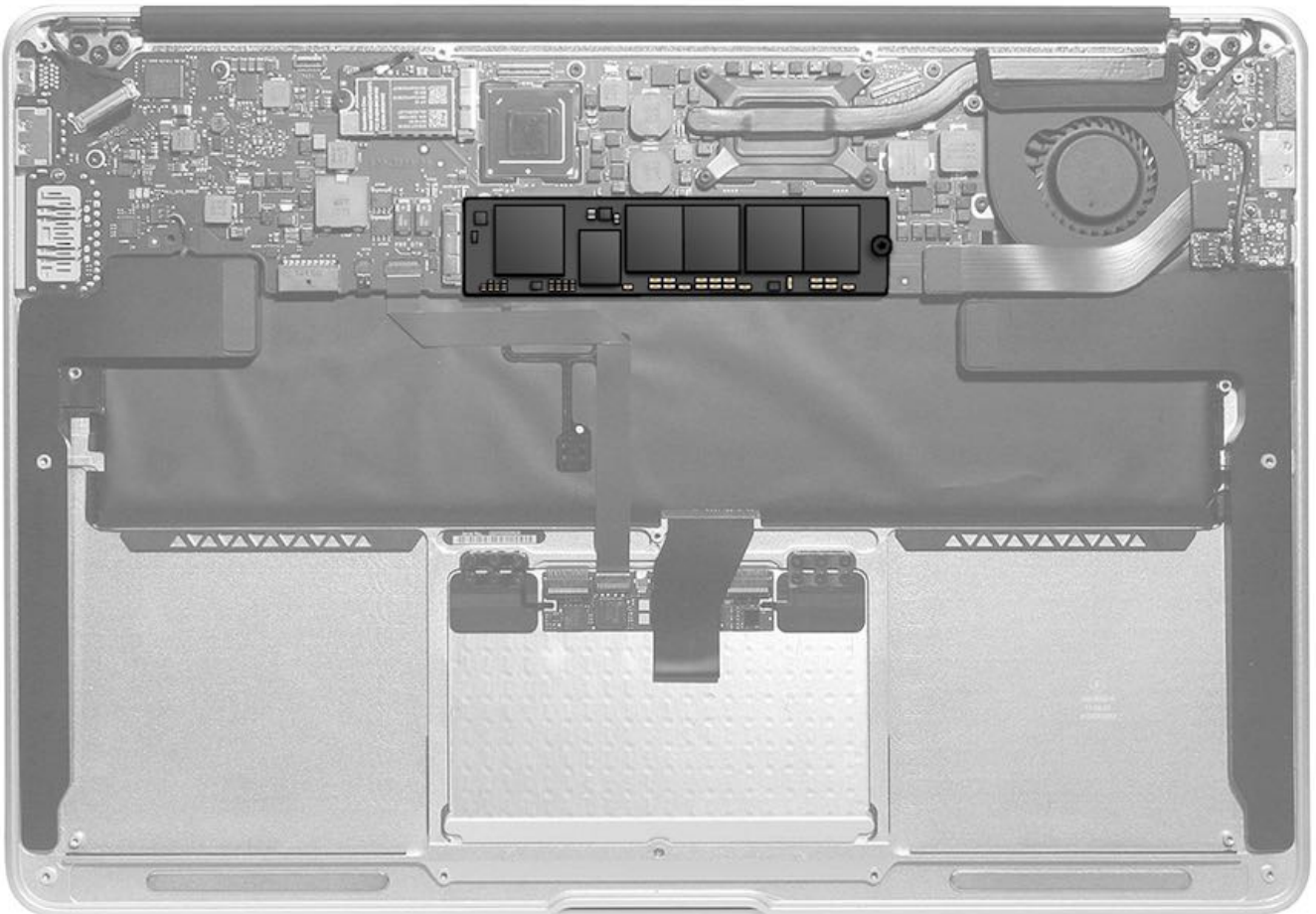
- [Bottom Case](#)



Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.

Caution: Make sure data is backed up before removing SSD card or flash storage.



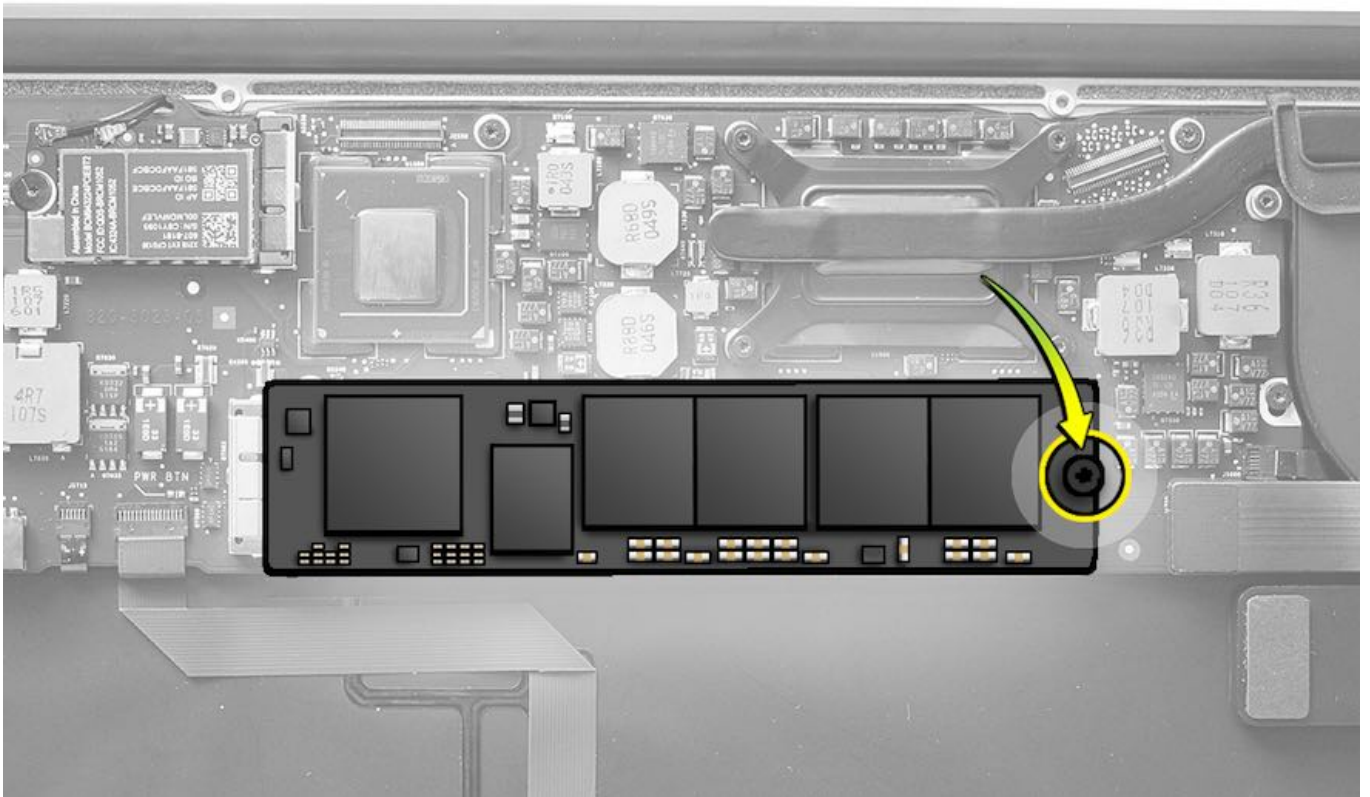
Tools

- ESD wrist strap
- Torx T5 screwdriver, magnetized



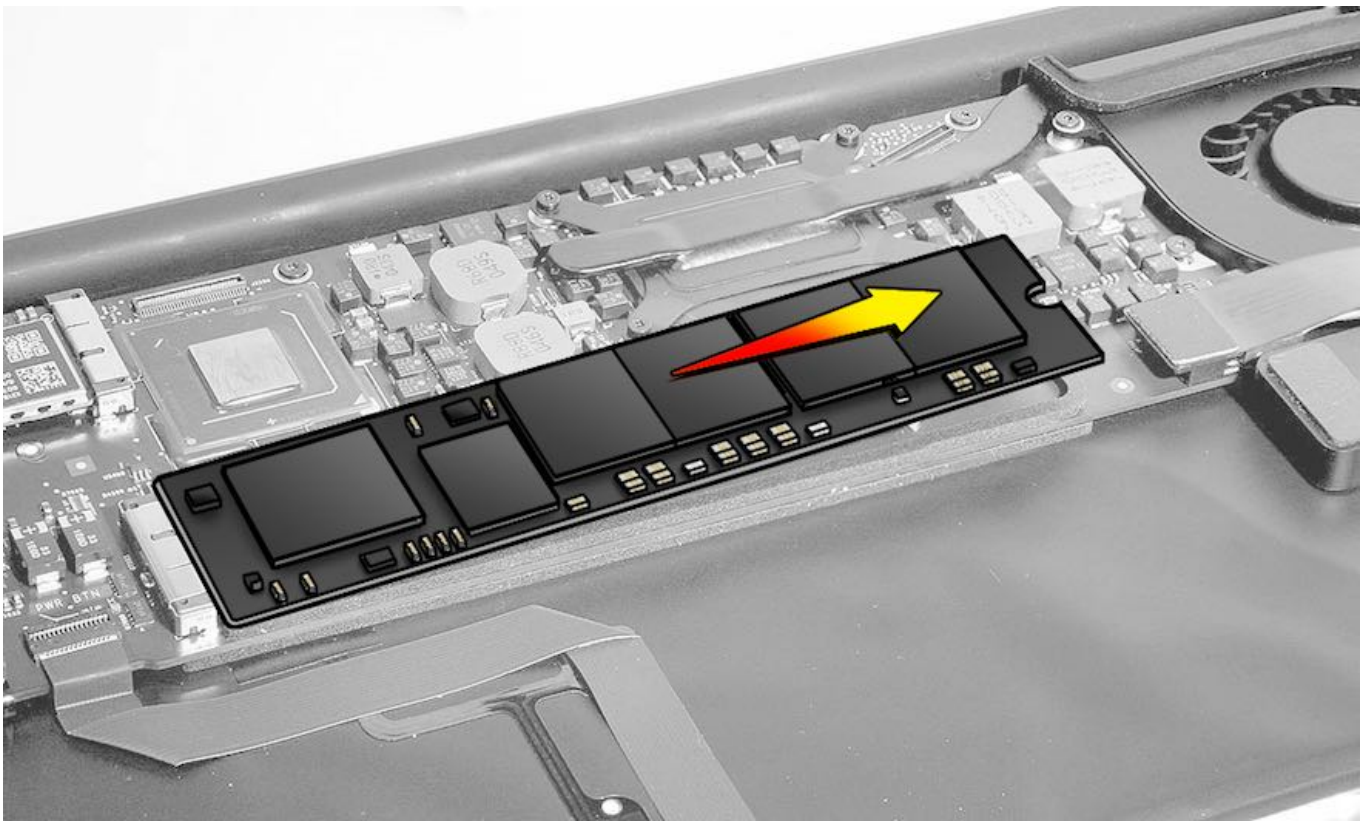
Steps For Removal

1. Remove one Torx #5 screw: 922-9651 (2.85 mm)



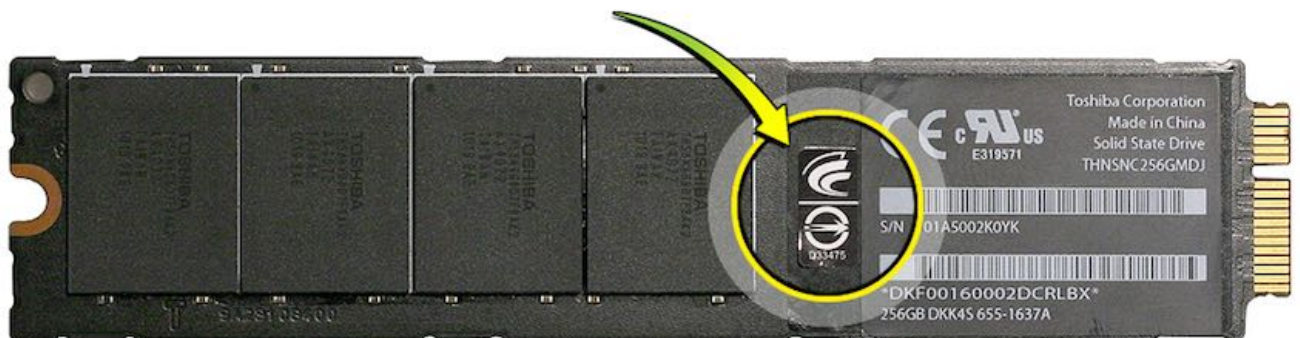
2. Tilt up flash storage at a slight angle (< 3 degrees) and gently pull it to disconnect it from logic board.

Reassembly Note: Push flash storage securely into slot confirming that it is seated properly.



Steps For Reassembly

Replacement Note: Locate and remove the compliance label from a new flash storage before installing it in the computer.



Portables and Desktops Mid 2011 or earlier: Reinstalling Software That Came With the Computer

Important: Apple recommends backing up essential user files before restoring OS X and other applications. Apple is not responsible for any lost data.

Be sure to install the correct system software build for the computer model being serviced. Refer to Apple Support articles:

- [HT1159: Mac OS X versions \(builds\) for computers](#)
- [HT4491: About restoring the correct version of Mac OS X](#)

If the computer shipped with **OS X 10.7 Lion**, see Apple Support article:

- [HT4718: OS X Lion: About Lion Recovery.](#)

If the computer shipped with **Mac OS X 10.6 Snow Leopard** or earlier, use the original system media to reinstall Mac OS X and any applications that came with the computer. Refer to Apple Support articles:

- [HT3910: Mac OS X v10.6 Snow Leopard: How to Erase and Install](#)
- [TS1394: Troubleshooting Mac OS X installation and software updates \(Mac OS X v10.6 and earlier\)](#)
- [HT2129: Reinstalling software using Remote Install Mac OS X v10.5 and v10.6](#)
- [HT4399: MacBook Air \(Late 2010\): Frequently Asked Questions about Software Reinstall Drive](#)
- [HT2735: MacBook Air \(Mid 2009, Late 2008, or Original\): Reinstalling applications, resetting the password, and using Disk Utility using the MacBook Air SuperDrive](#)

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012): AirPort/Bluetooth Card

First Steps

For video instruction, refer to Apple Support article [SV171: Wireless Card Replacement Video](#).

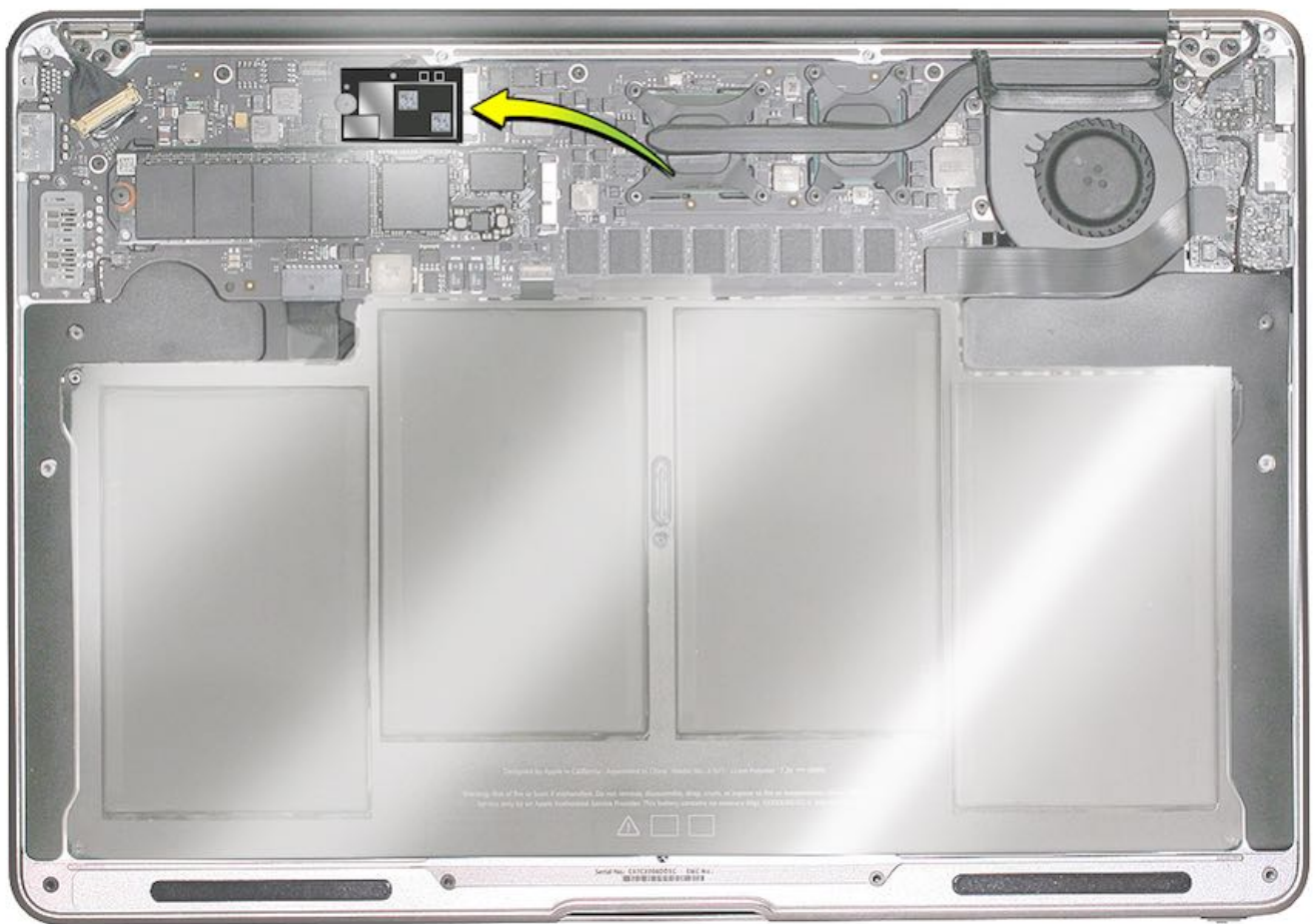
Remove:

- [Bottom Case](#)



Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Tweezers
- Torx T5 screwdriver, magnetized

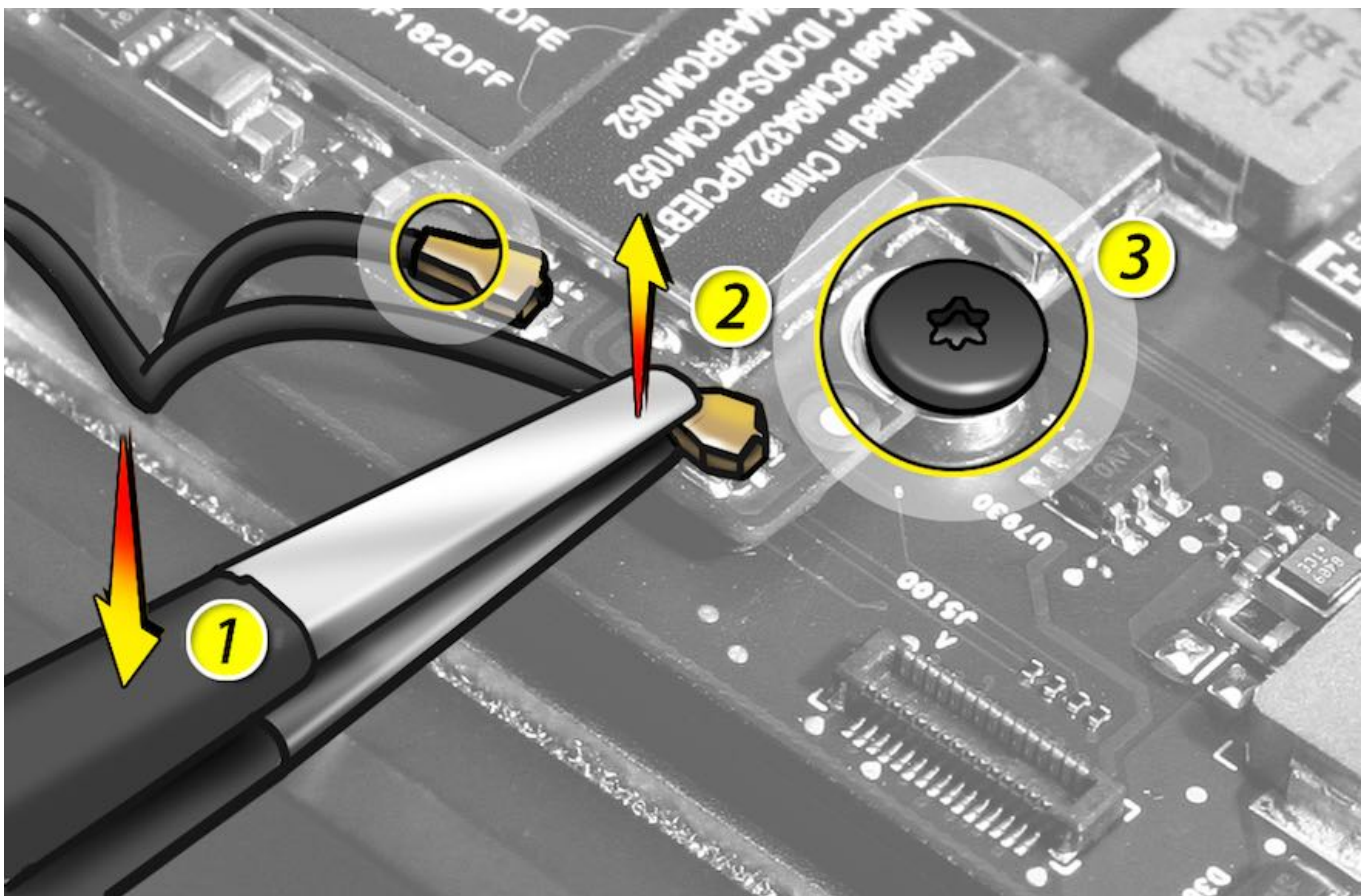


Steps For Removal

Caution: Avoid stressing antenna cables when disconnecting them.

1. Rotate case so clutch cover faces you.
2. Brace tweezers against clutch cover and carefully grip antenna cable on metal extension behind connector head (area indicated by circle). Using tweezers like a lever, gently pop cable straight up off card.

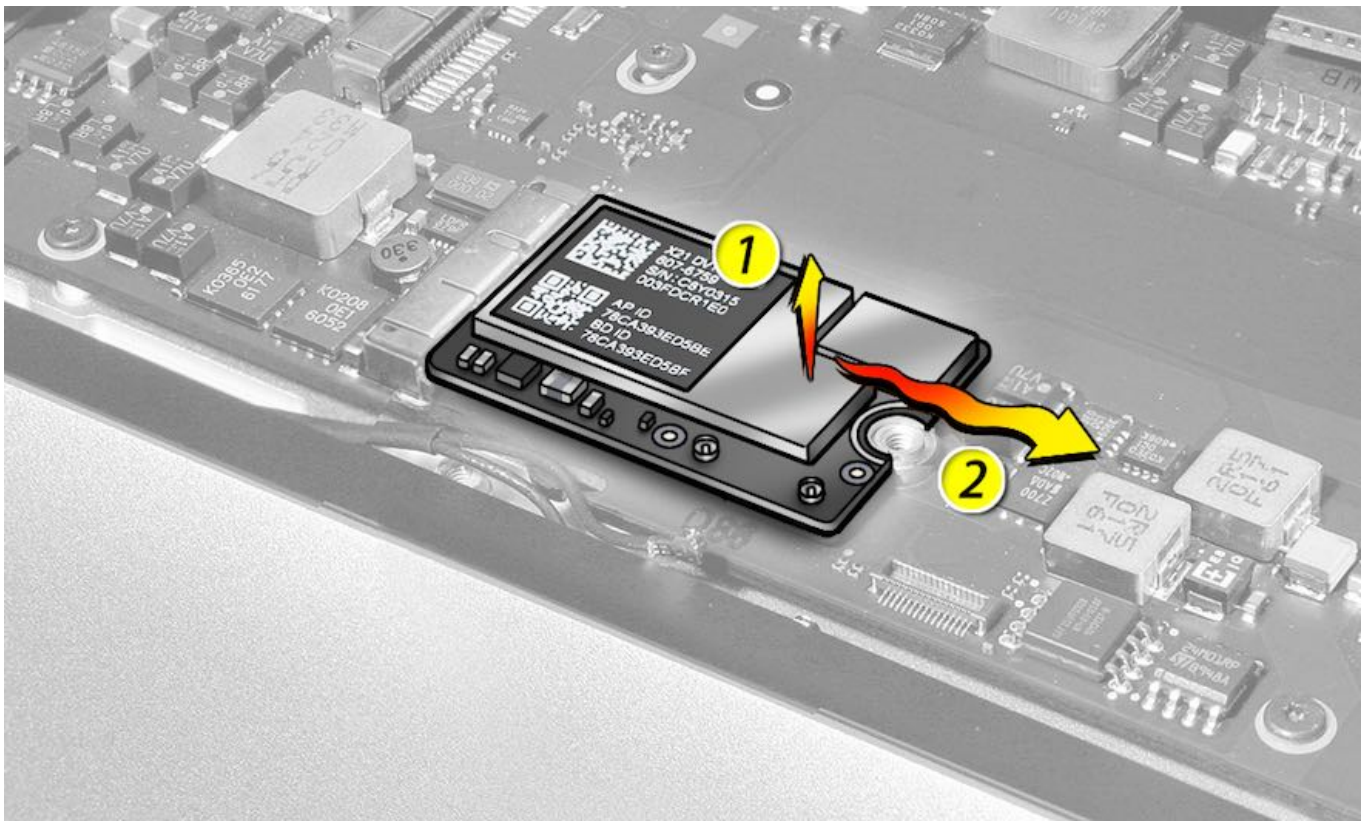
Note: If cable has not been previously disconnected, you may have to apply additional force.



3. Remove Torx T5 screw 922-9651 (2.85 mm).



4. With your fingers, slightly tilt up card (enough to clear screw standoff).
5. Rock and pull card to disconnect it from logic board connector.

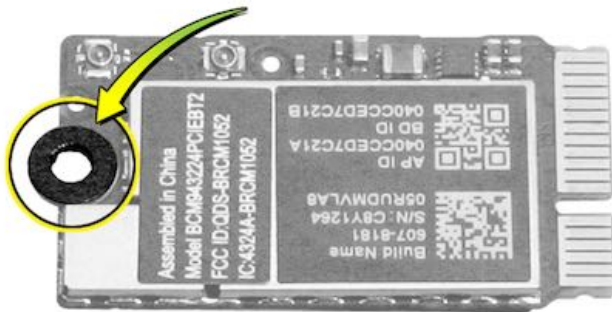


Steps For Reassembly

Note: Mid 2011 AirPort/Bluetooth replacement card includes insulator ring that must be removed before installing card.

1. When installing replacement Mid 2011 card:

- Carefully pry insulator ring off card.
- Remove any residual adhesive from card.



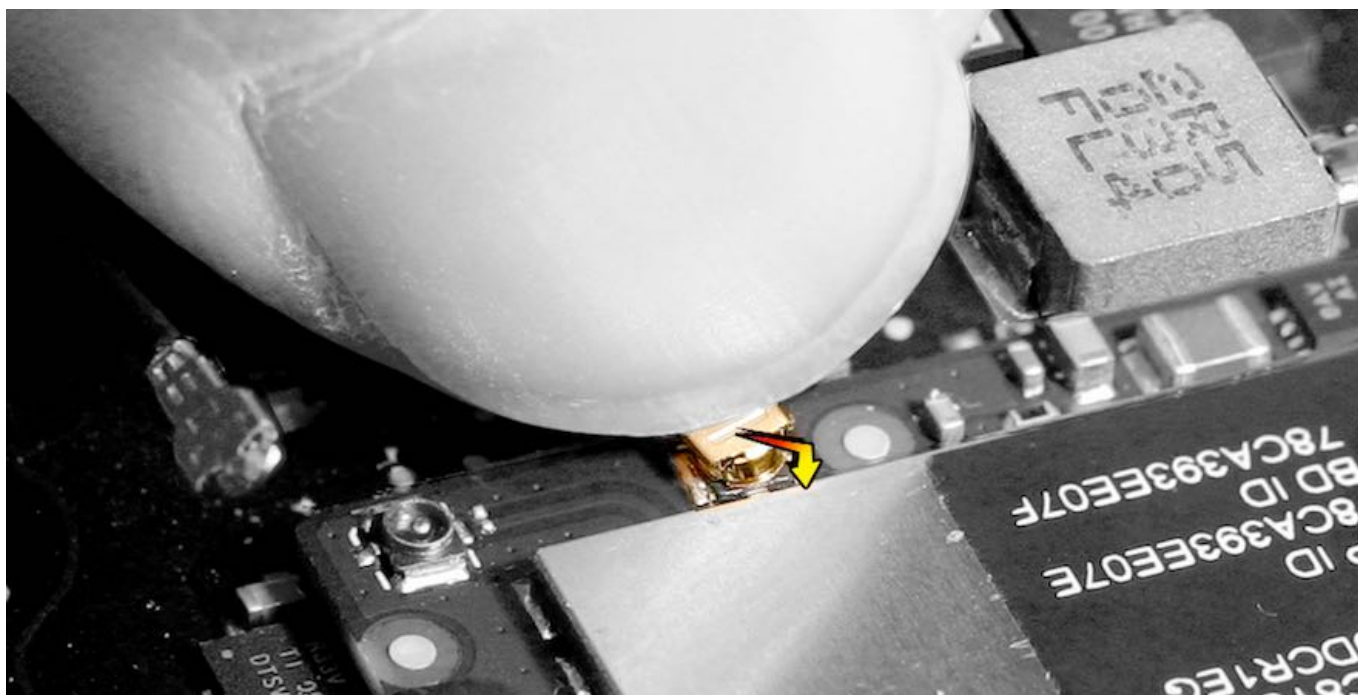
Note: Late 2010 and Mid 2012 AirPort/Bluetooth cards do not come with an insulator ring.



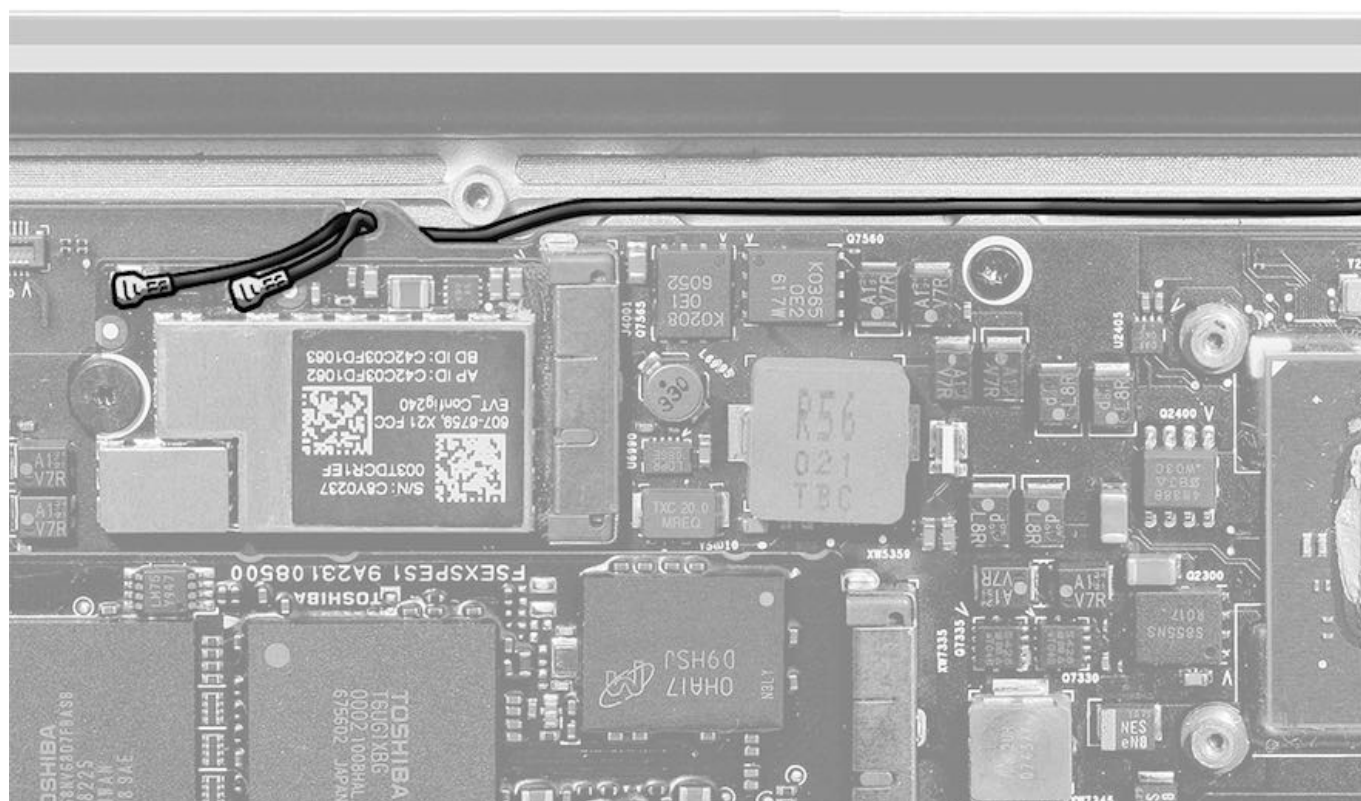
2. Using tweezers, position antenna head over connector until you feel it seat with connector. Carefully press straight down with a finger until head snaps into place.

Caution: Using too much force to reseat antenna cables can bend or damage connector or connector rim.

3. Replace screw.



4. **Important:** Make sure cables are properly routed through the cutout in logic board.



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Input/Output (I/O) Flex Cable

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV163: I/O Flex Replacement Video](#).

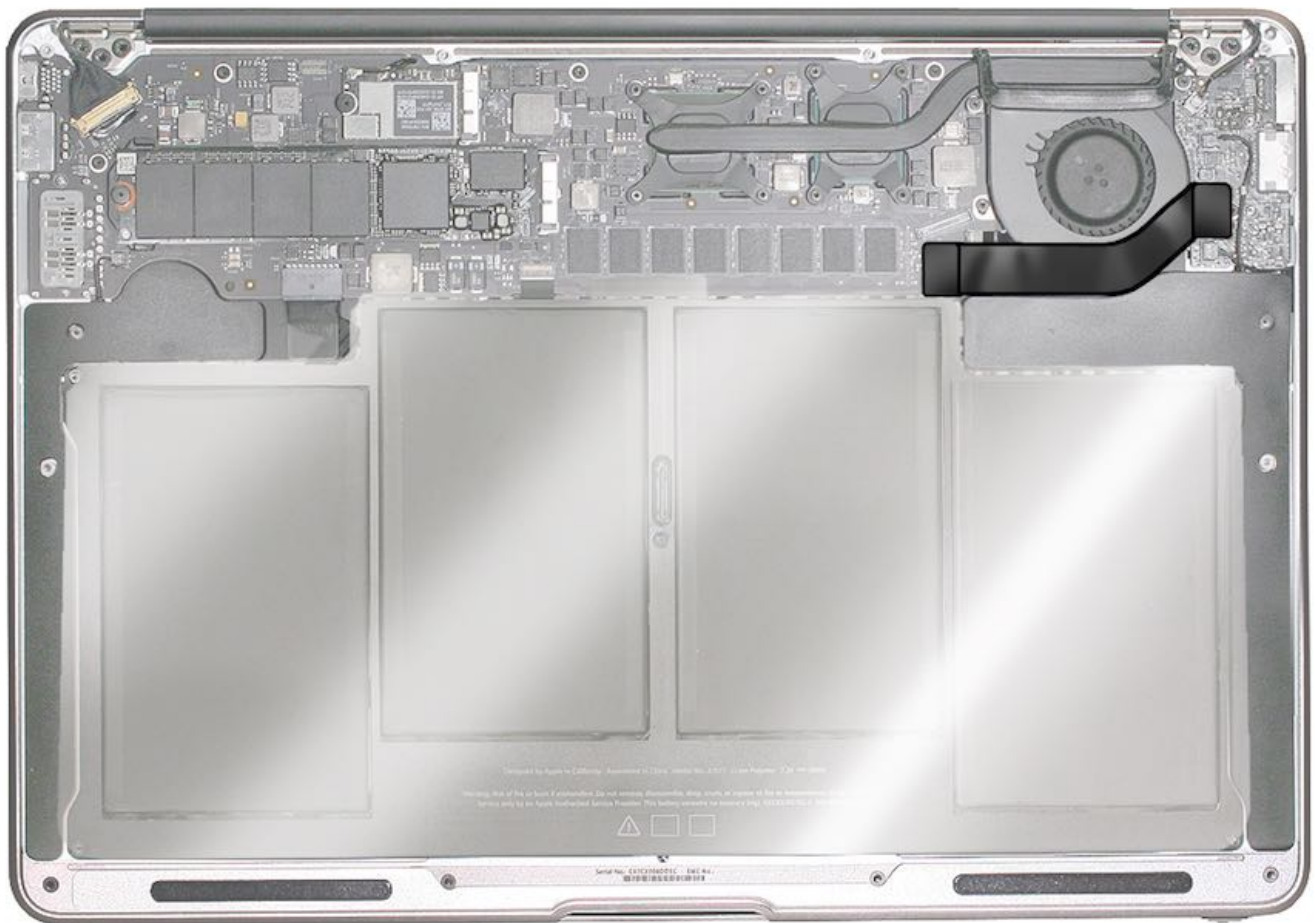
Remove:

- [Bottom Case](#)



Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Black stick

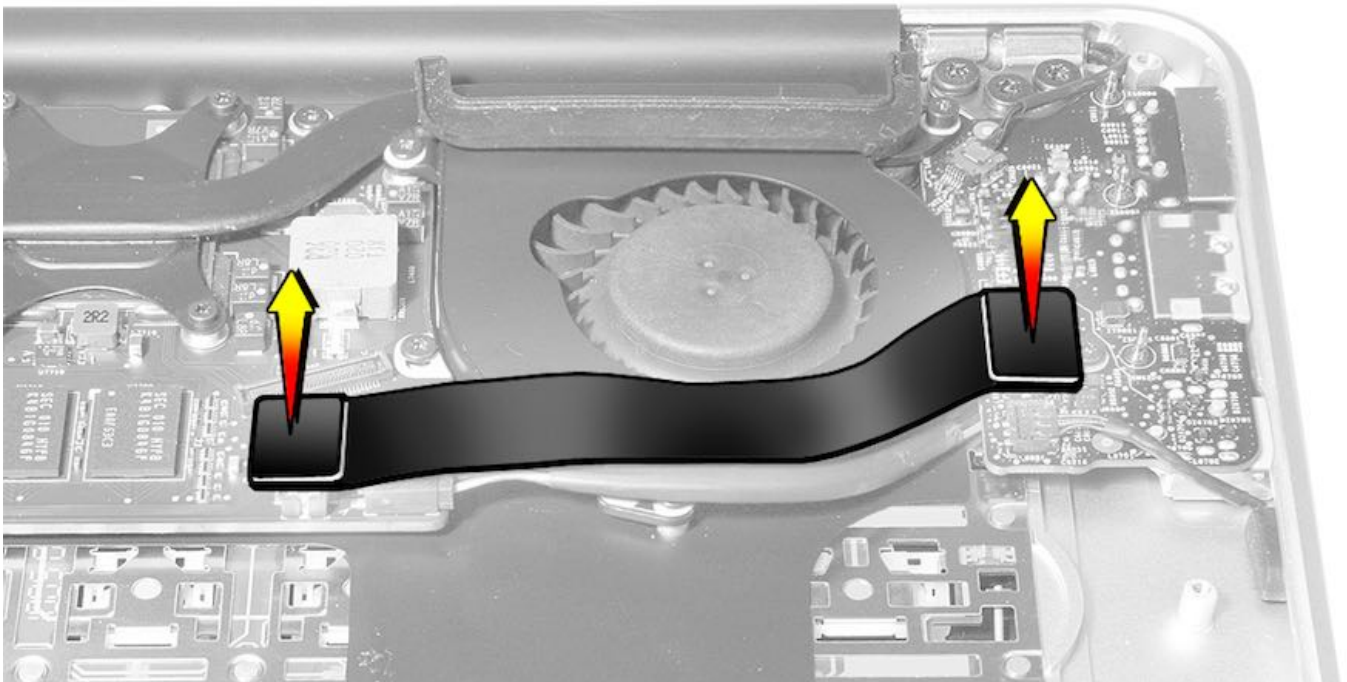


Steps For Removal

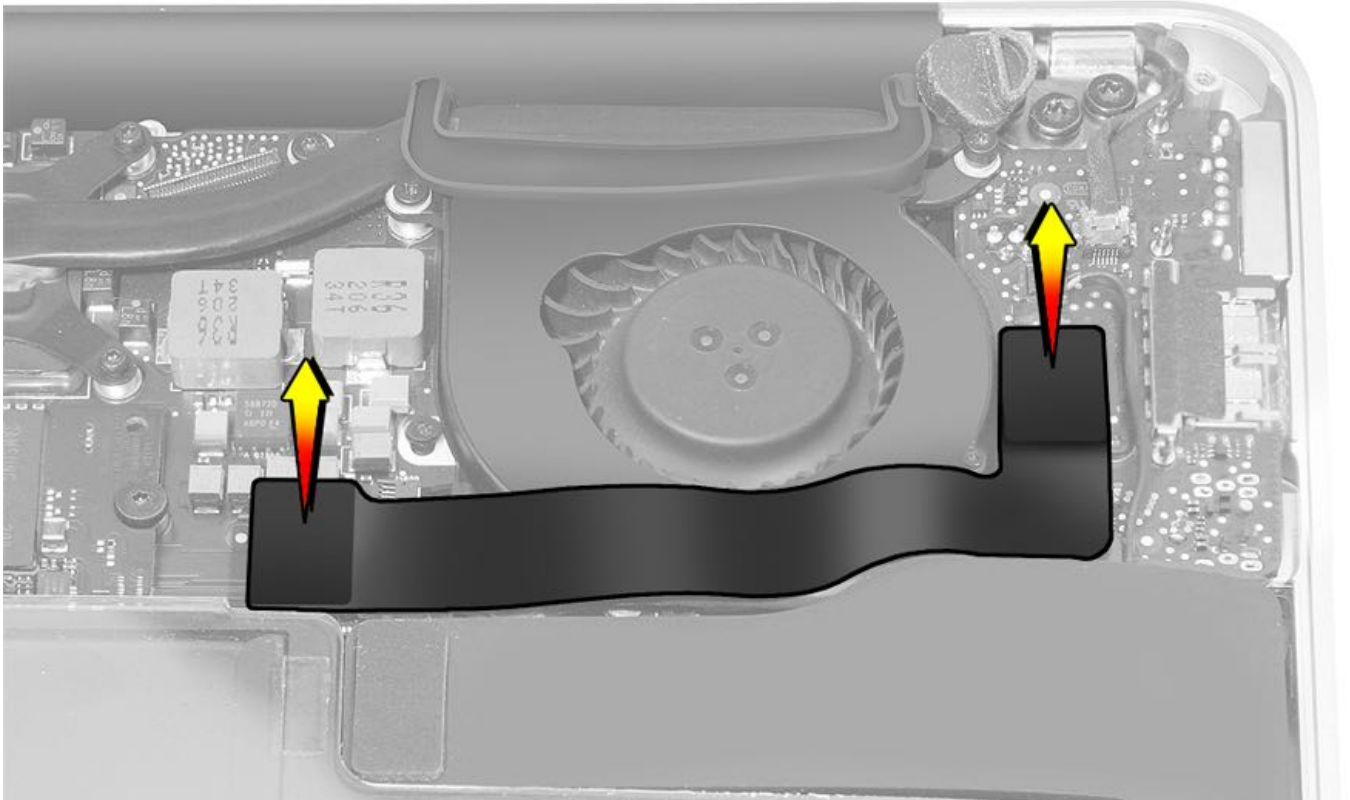
1. Remove cable in straight vertical motion from connectors.

Replacement Note: Check for pin deformation on logic or I/O board connectors before inserting cable. Press firmly on each end of cable to securely attach connector to the boards.

Late 2010 and Mid 2011



Mid 2012, Mid 2013, Early 2014



Note: I/O cable has a liquid contact indicator on underside.

Late 2010 and Mid 2011



Mid 2012, Mid 2013, Early 2014



Steps For Reassembly

Replacement Note: For more information on reseating the I/O flex cable, refer to Apple Support article [OP490: Alignment and reseating of LIO Flex Cable](#).

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Fan

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV172: Fan Replacement Video](#) (Mid 2012) and [SV155: Fan Replacement Video](#) (Mid 2013 and Early 2014).

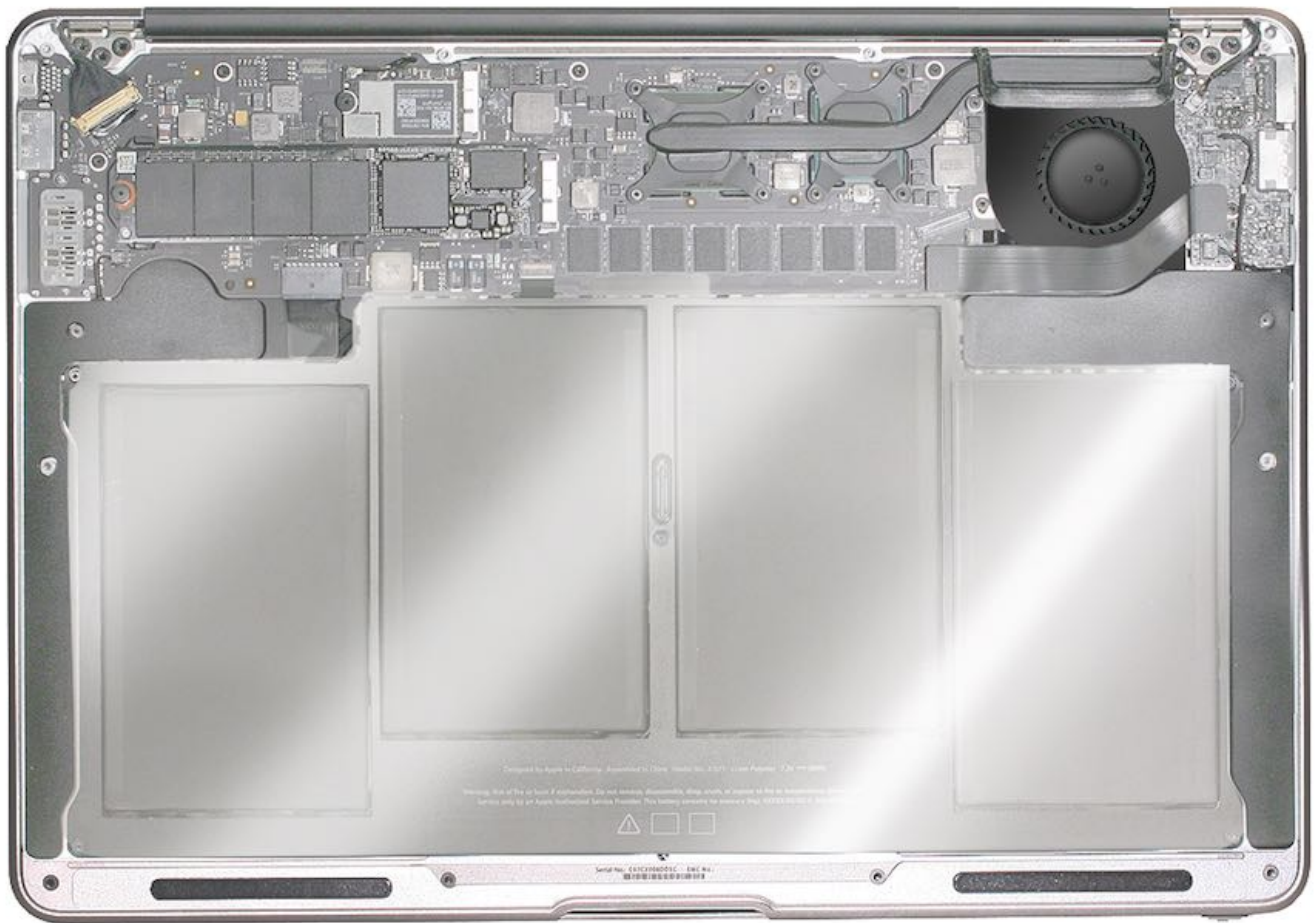
Remove:

- [Bottom Case](#)
- [I/O Flex Cable](#)



Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Black stick

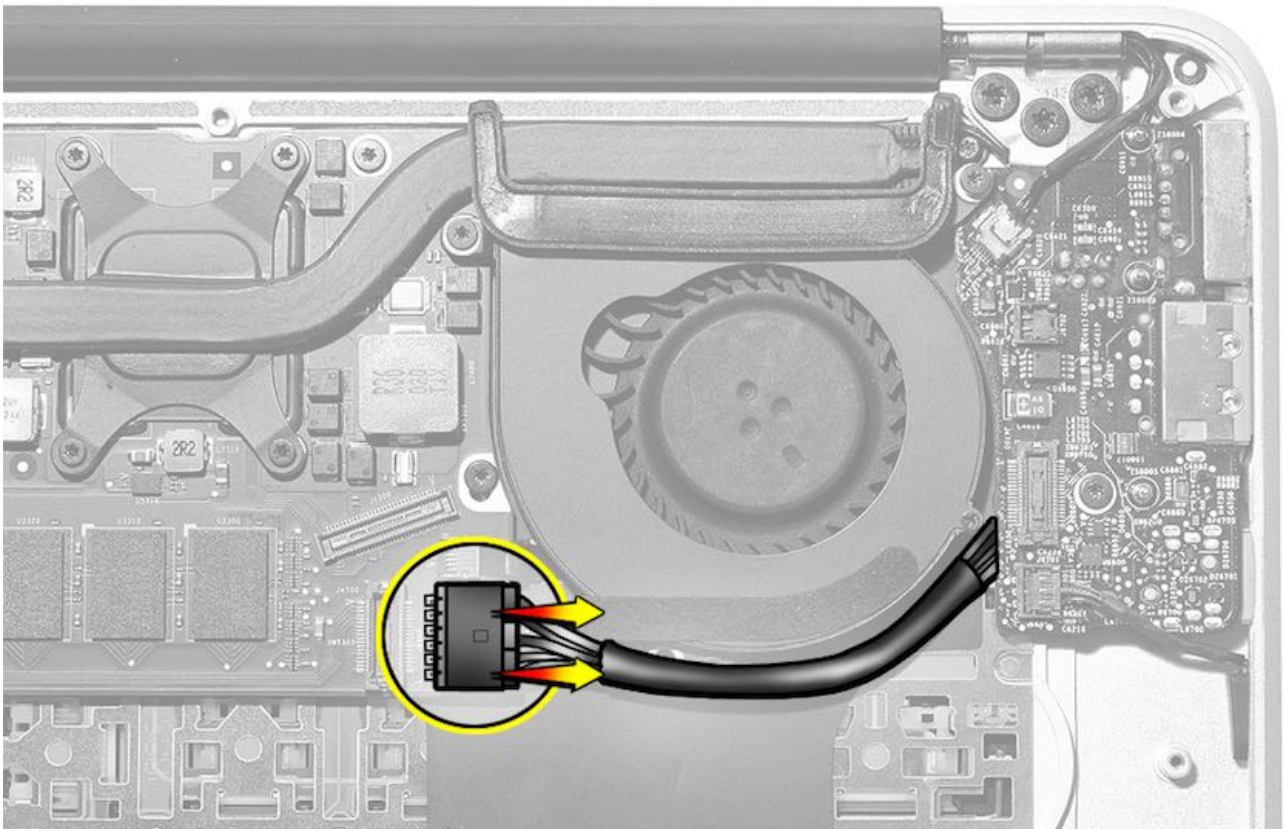
- Torx T5 screwdriver, magnetized



Steps For Removal

1. Disconnect I/O board cable from logic board.

Replacement Note: If the I/O board was removed, install it prior to replacing the fan.



2. Remove three Torx #5 screws.

Note: Each screw is a different size.

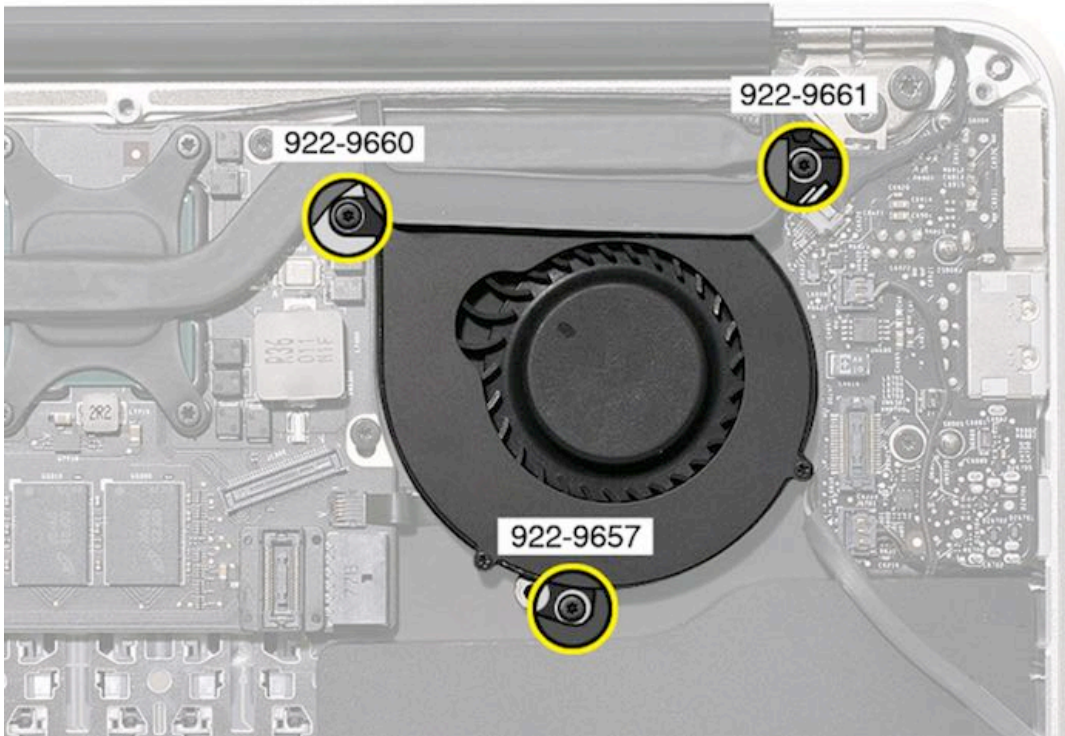
922-9660 (2.7 mm, short, top left)



922-9661 (3.6 mm, long, top right)

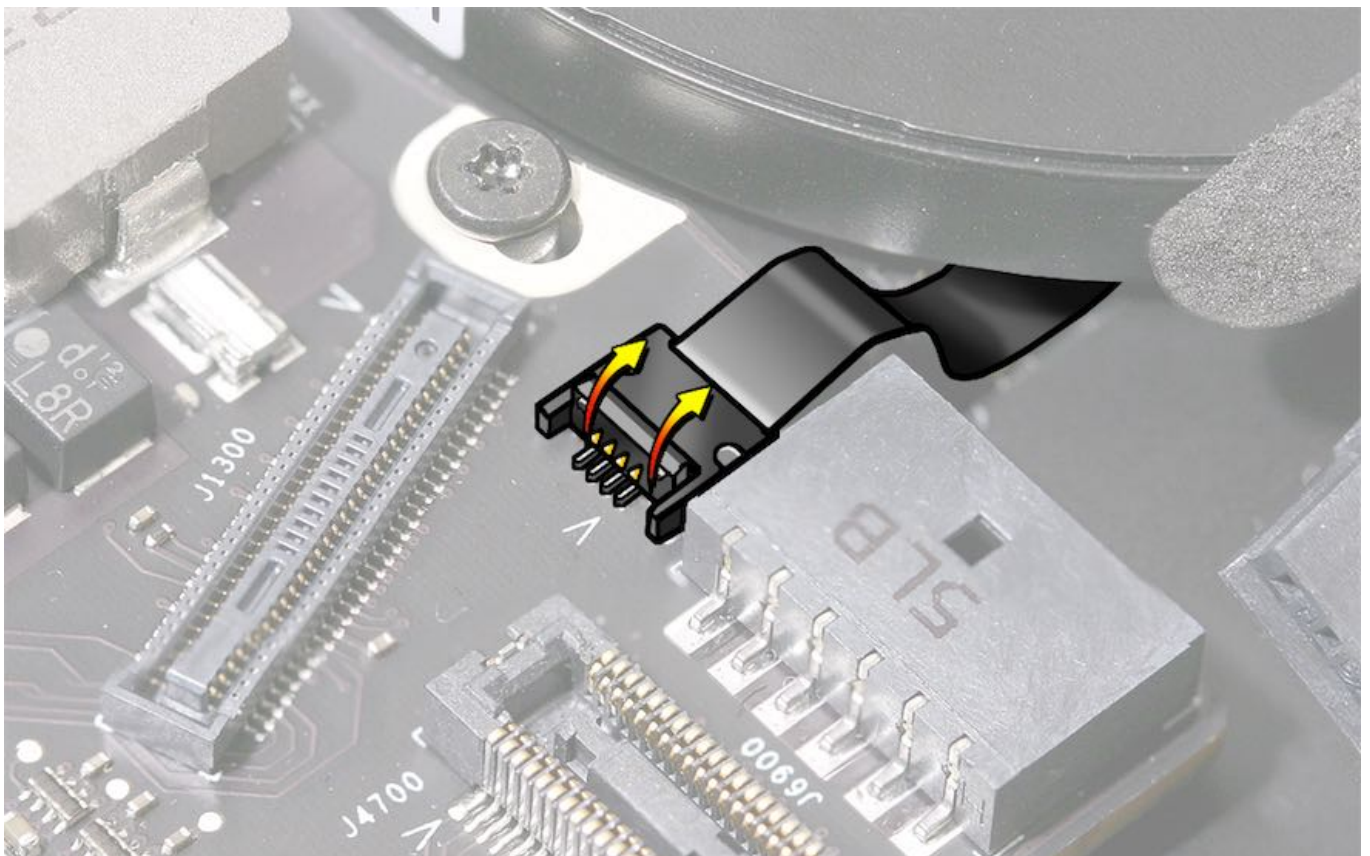


922-9657 (3.6 mm, medium, bottom)

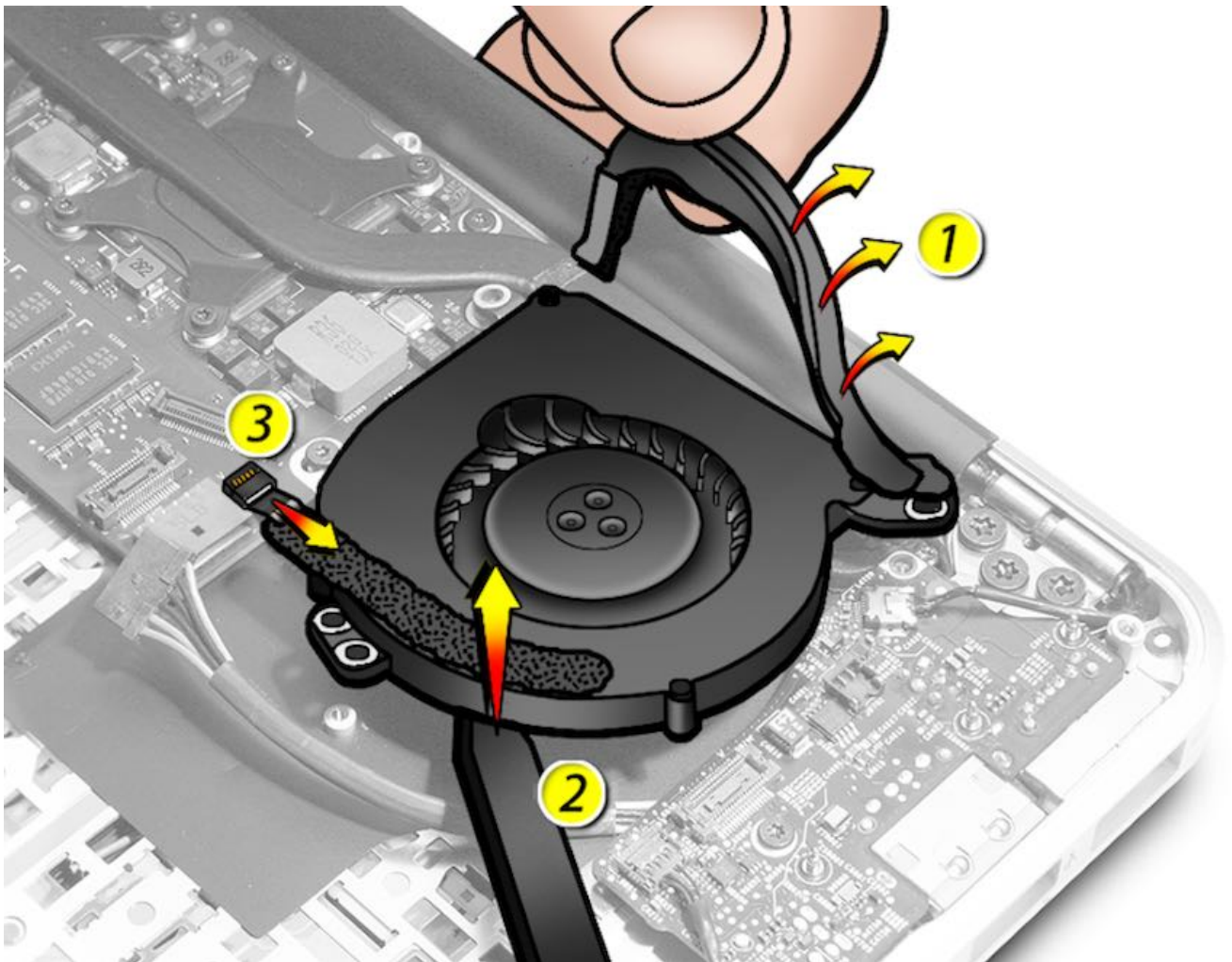


3. On the logic board, lift locking lever and carefully disconnect flexible fan cable.

Replacement Note: Insert cable before titling fan into top case. Check that locking lever is flipped down to secure flexible cable.



4. Lift thermal gasket (1), pry fan up (2), and gently pull flexible fan cable out of connector (3).



Steps For Reassembly

1. Insert tiny fan flex cable into connector and close locking lever.
2. Install fan in top case and replace 3 fan screws.
3. Check that rubber gasket is flat and adheres to top of fan.

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012): Microphone

First Steps

For video instruction, refer to Apple Support article [SV164: Microphone Replacement Video](#).

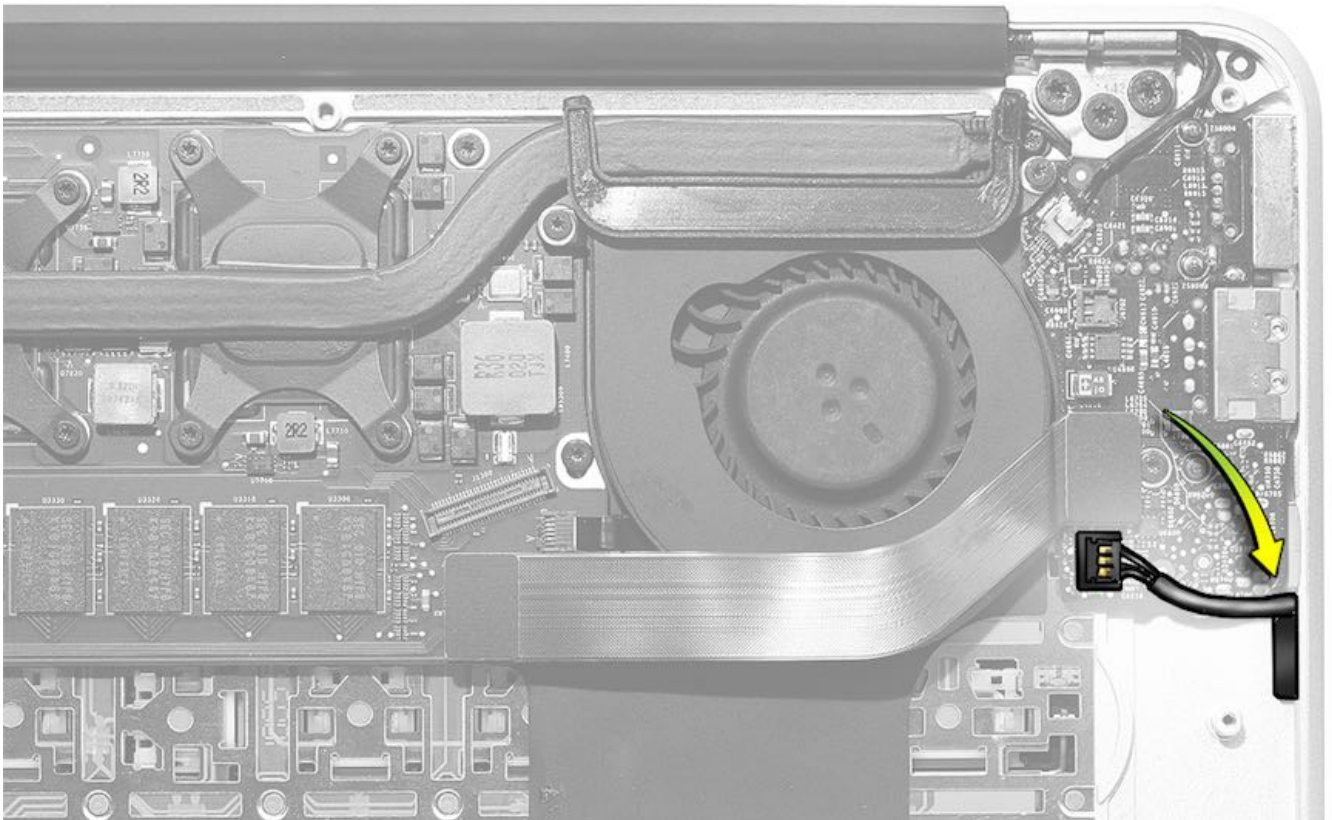
Remove:

- [Bottom Case](#)
- [Battery](#)
- [Left Speaker](#)



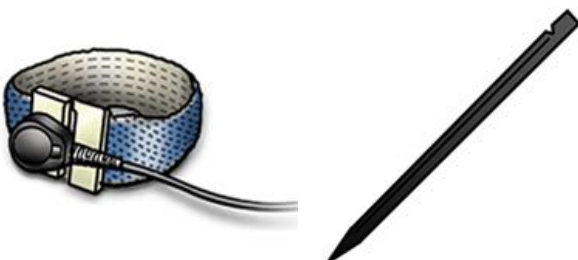
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

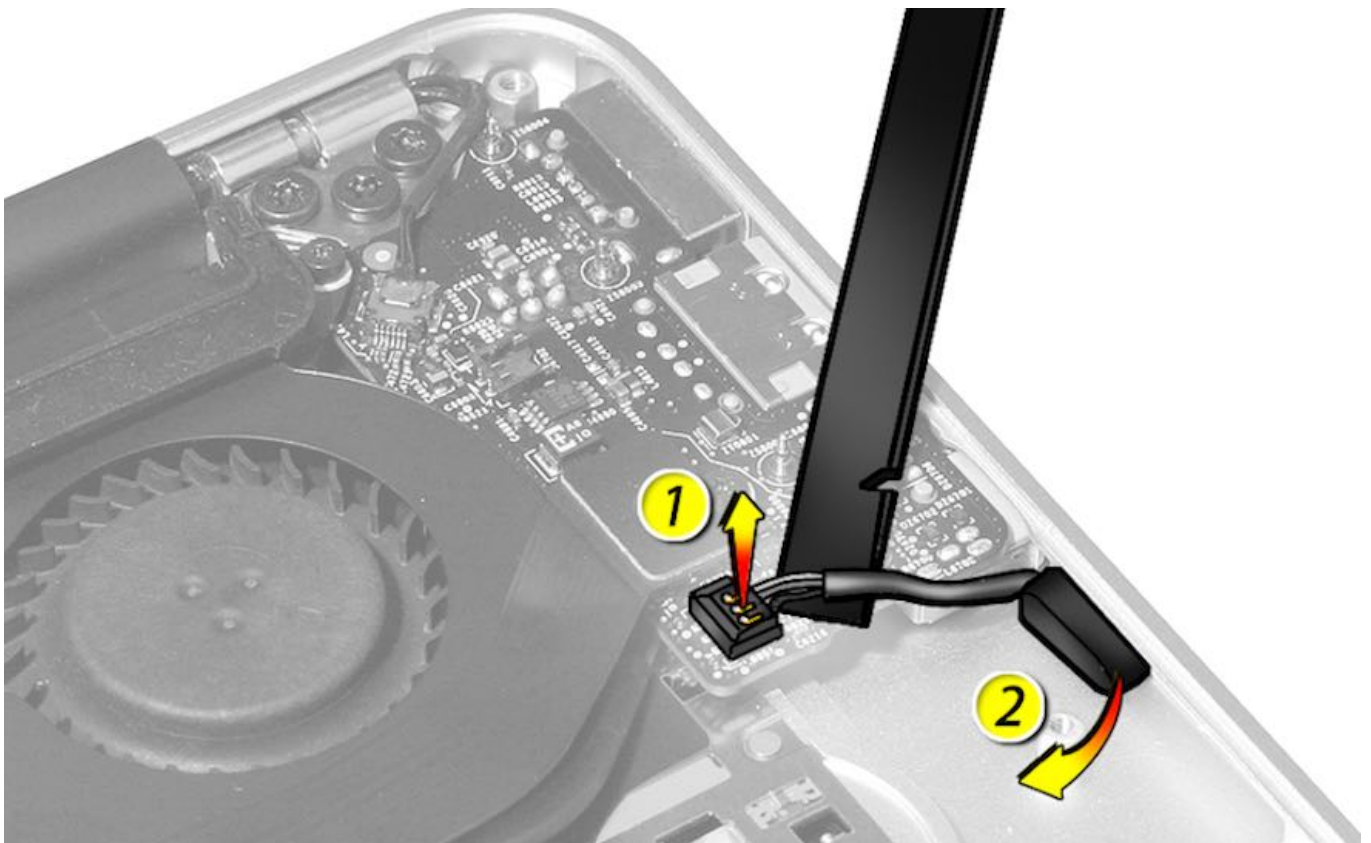
- ESD wrist strap
- Black stick
- Pencil



Steps For Removal

1. With a pencil, mark the inside top case at end of microphone.
2. Use black stick to disconnect microphone cable from I/O board.
3. With sharp end of black stick, carefully pry microphone from top housing.
4. Clean any adhesive residue from top case.

Note for Mid 2011/2012 Models: Because you replace the left speaker when you replace the microphone, it's especially important to make sure the top case is clean and free of any residual adhesive or debris. Use only the adhesive preinstalled on the new speaker; otherwise, it will not fit properly. **The adhesive must lie flat in a single layer**, either on the speaker area of the top case or on the speaker itself. Do not double up speaker adhesive.

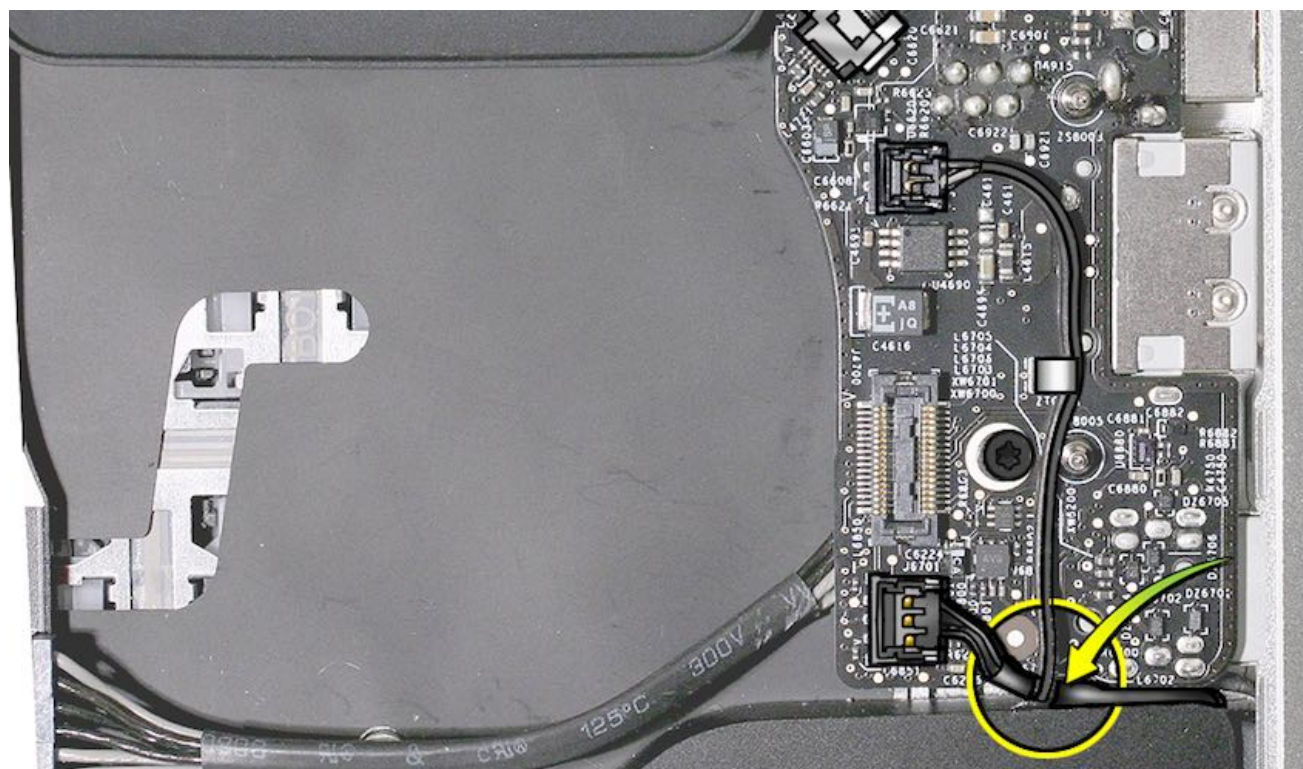


Steps For Reassembly

1. Peel off protective layer from adhesive on new microphone.
2. Align microphone with pencil mark on top case. Apply light pressure to set the very high bond (VHB) adhesive.
3. Align microphone cable with bottom of I/O board.
4. Route microphone into notch on I/O board, as shown, and connect to I/O board.

Replacement Note for Mid 2011/2012 Models: Install the new left speaker that is included with the microphone kit.

Replacement Note for All Models: Make sure microphone cable routes under left speaker cable.



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012): Input/Output (I/O) Board

First Steps

For video instruction, refer to Apple Support article [SV173: I/O Board Replacement Video](#).

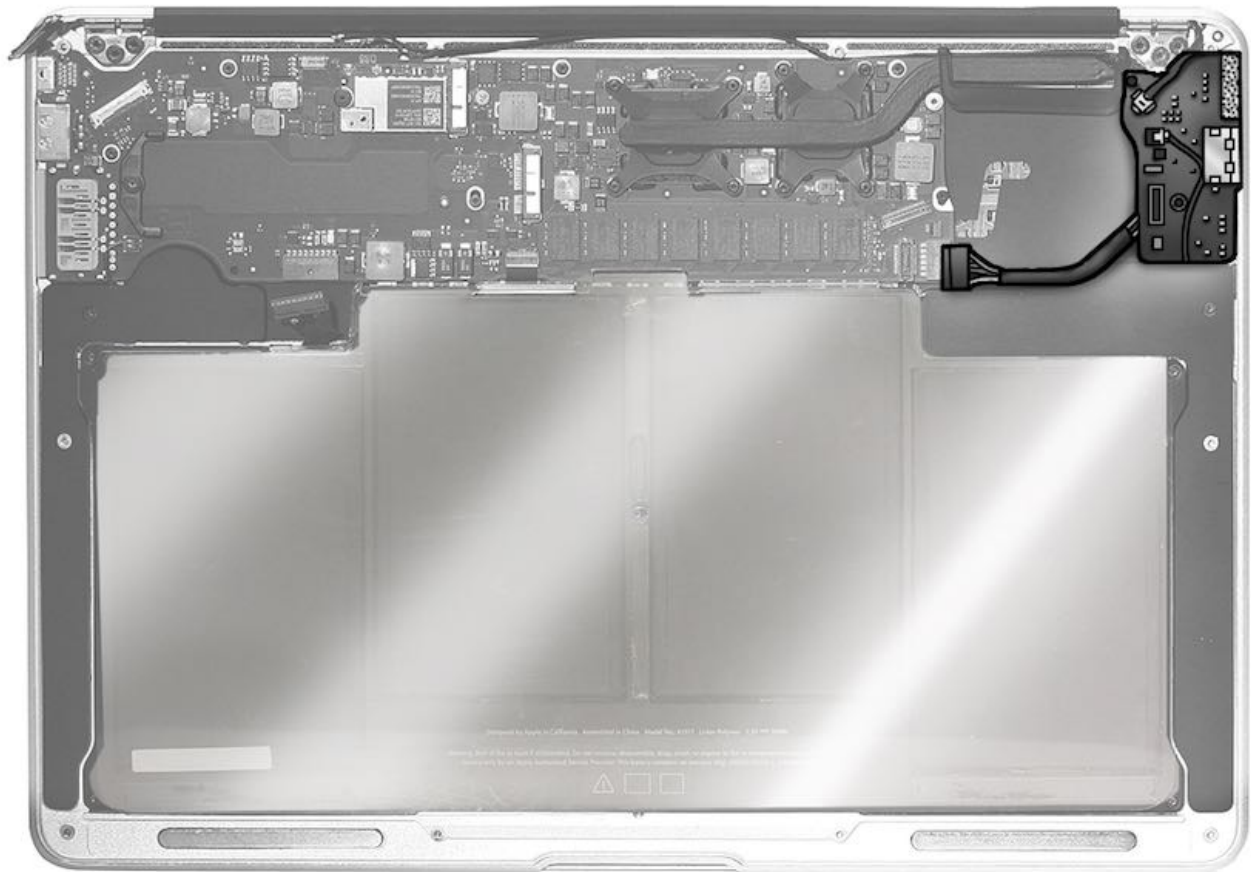
Remove:

- [Bottom Case](#)
- [I/O Flex Cable](#)
- [Fan](#)



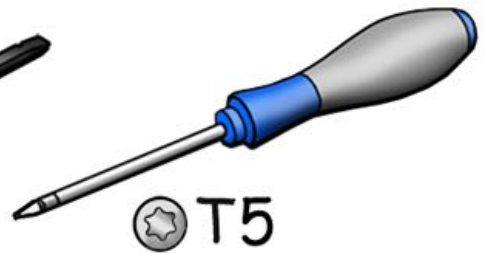
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Black stick
- Torx T5 scredriver, magnetized



Steps For Removal

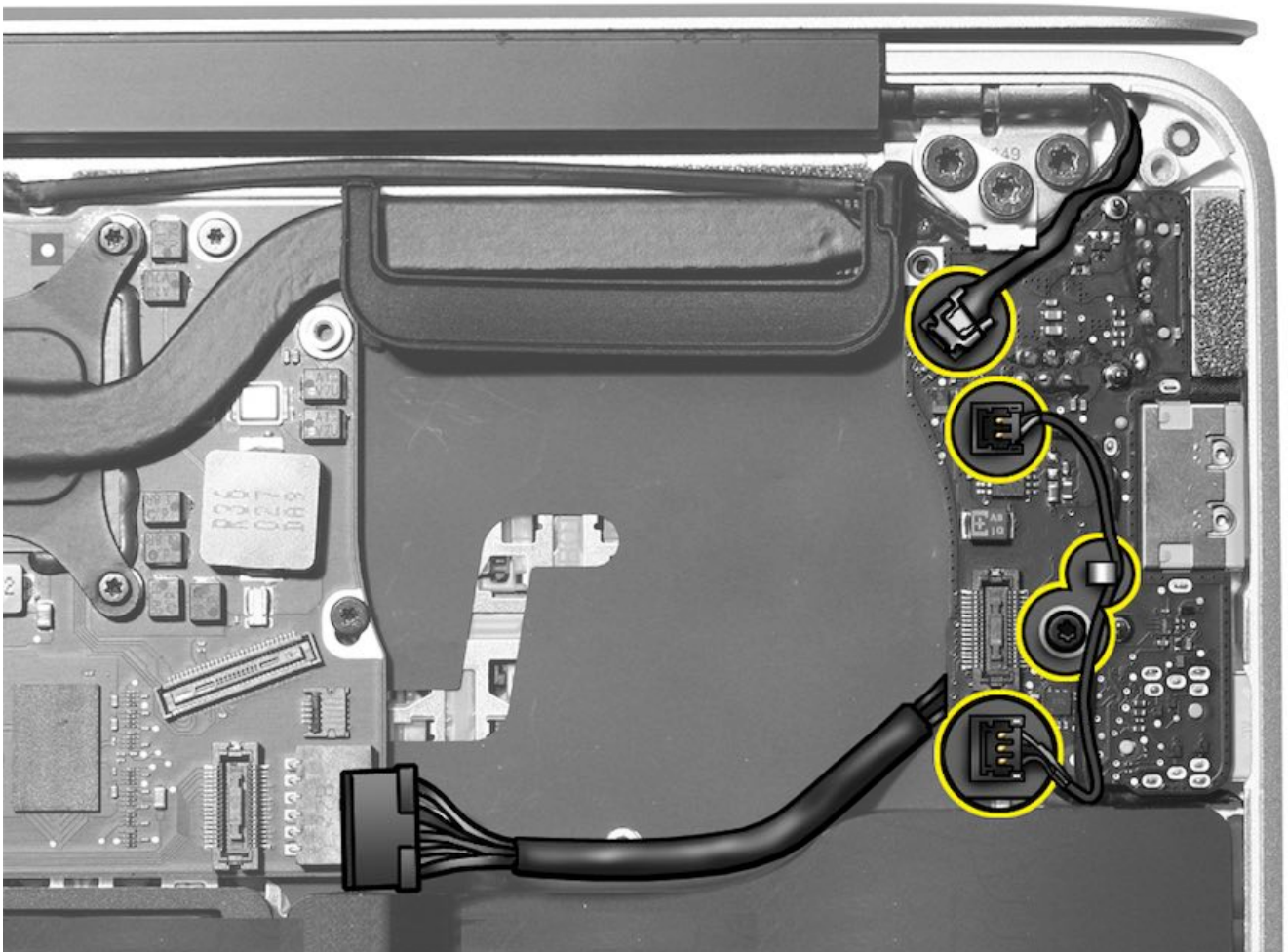
1. Disconnect or remove the following, listed from top to bottom:

- Camera cable
- Left speaker cable/clip
- T5 screw: 922-9656 (3.62 mm)

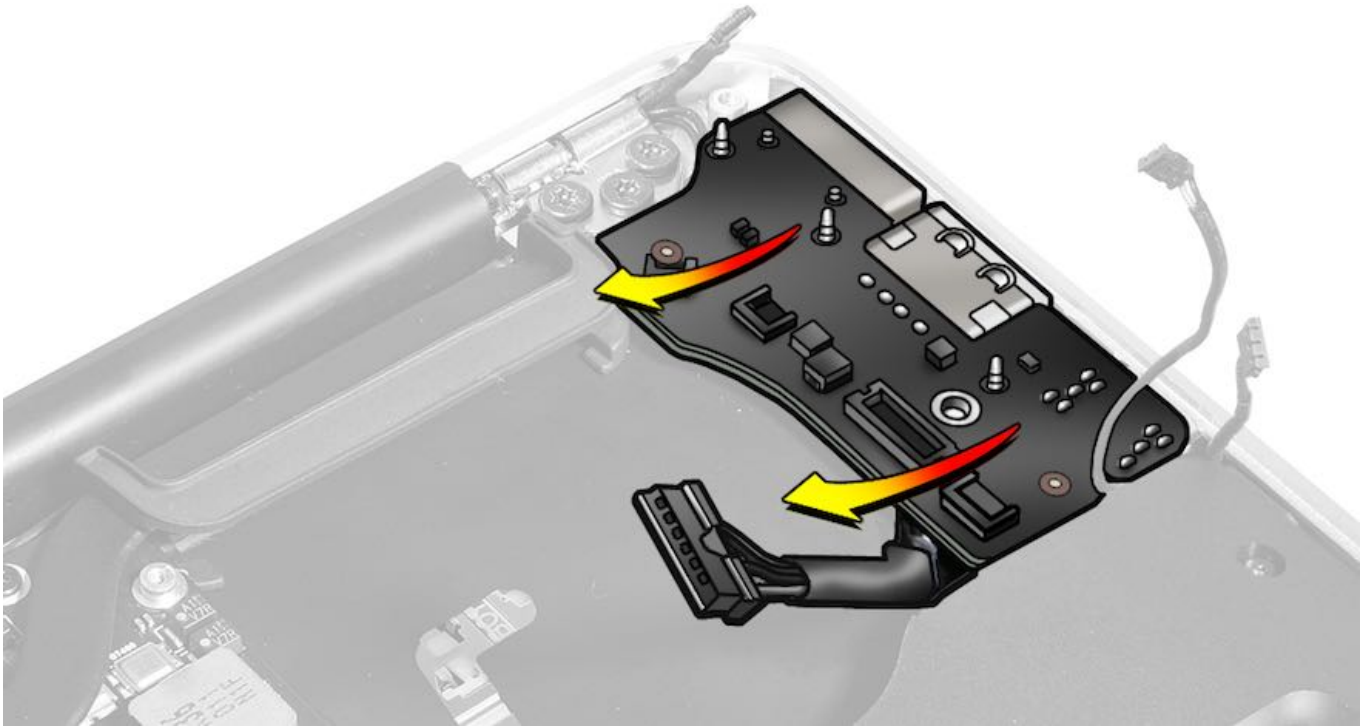


- Microphone cable

Note: If you have not already done so, disconnect the I/O board cable from the logic board.

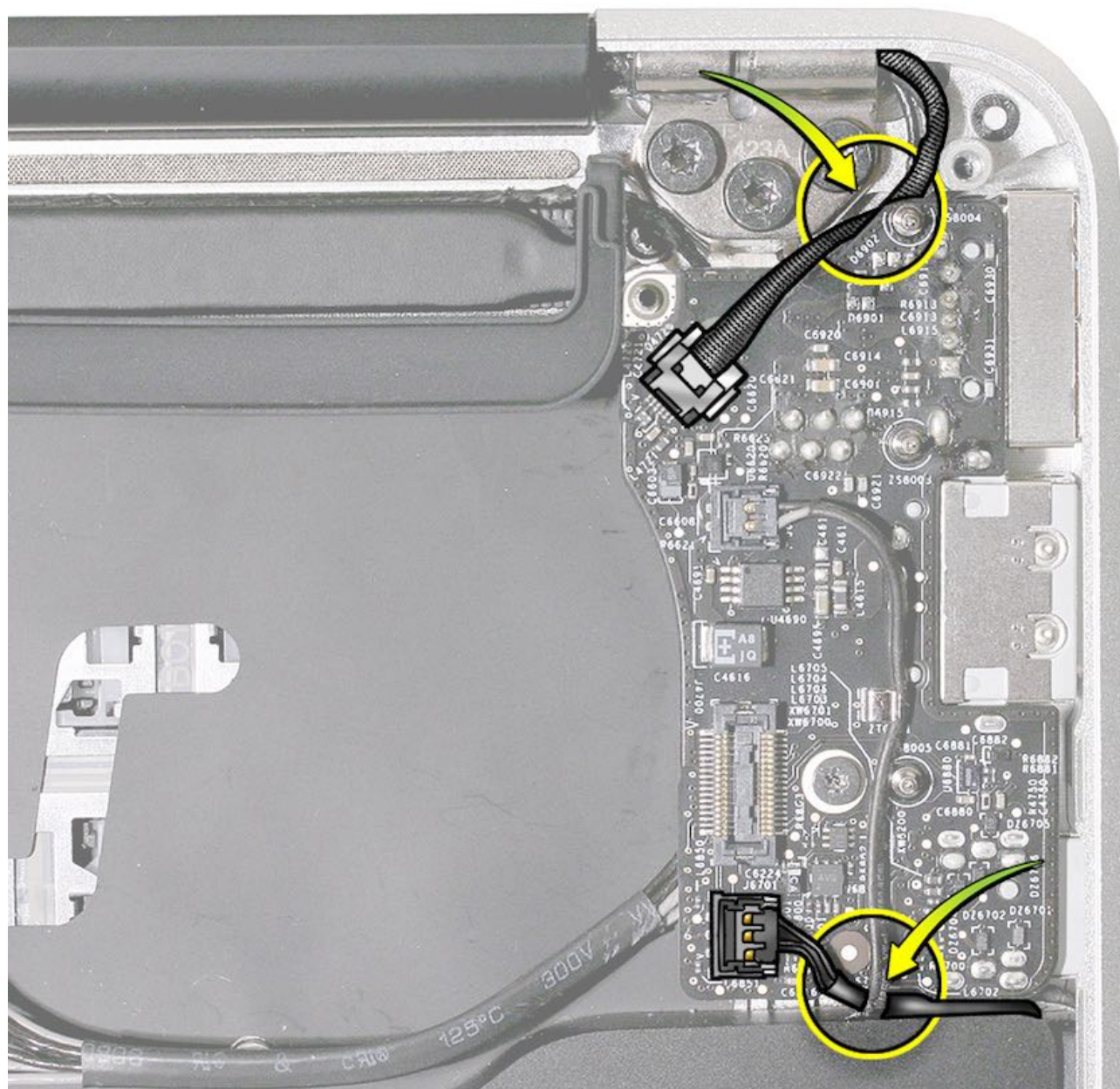


2. Tilt slightly and move I/O board away from ports and out of top case.



Steps For Reassembly

1. Tip I/O board into top case, and push it firmly against top case wall to secure ports.
2. Check that camera cable (at top) and microphone cable (at bottom) are tucked under the I/O board as shown.
3. Replace T5 screw: 922-9656 (3.62 mm).
4. Reconnect camera, left speaker, and microphone cables.
5. Reconnect I/O board cable to logic board.



MacBook Air (13-inch, Late 2010): Input Device (IPD) Flex Cable

First Steps

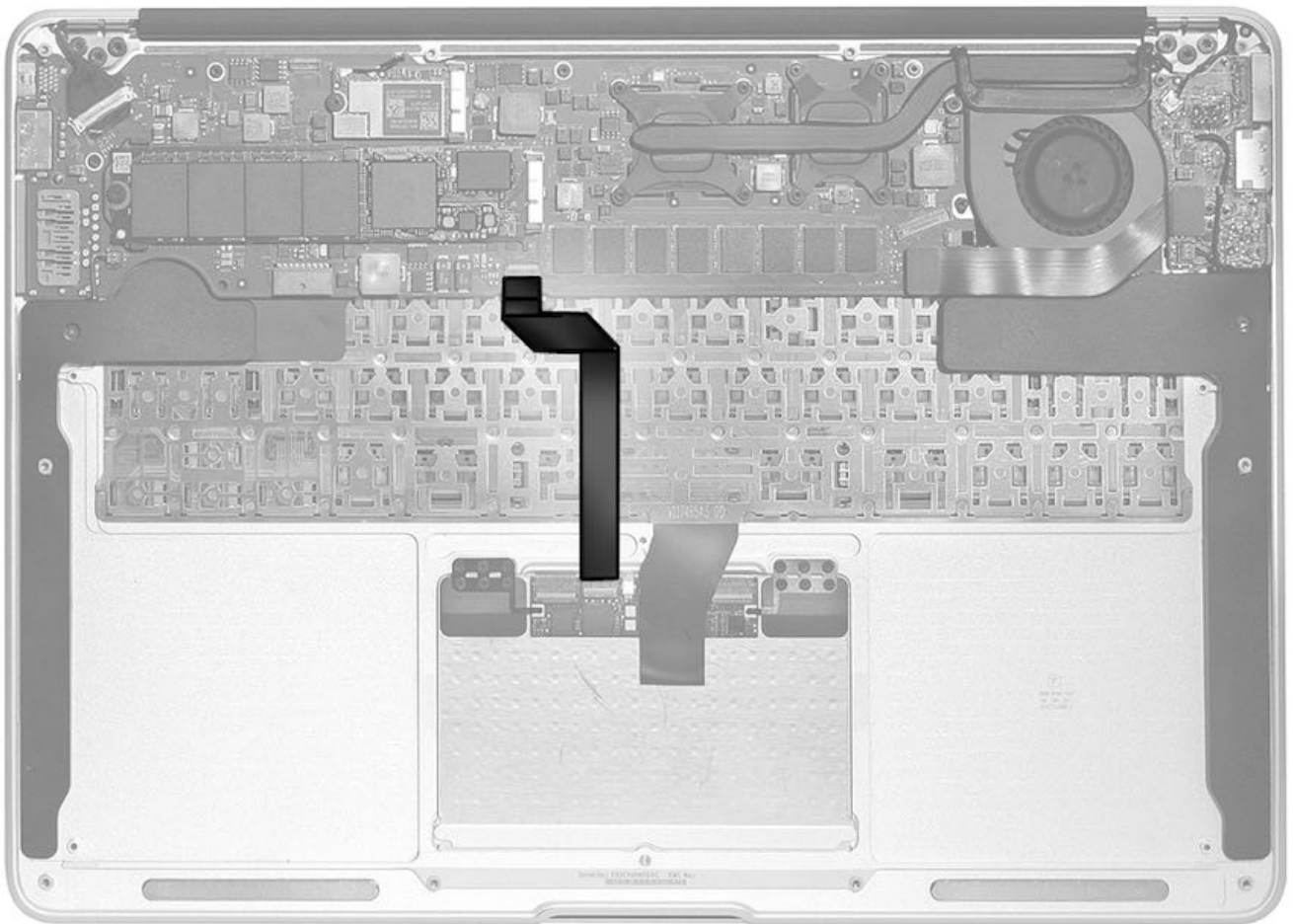
Remove:

- [Bottom Case](#)
- [Battery](#)



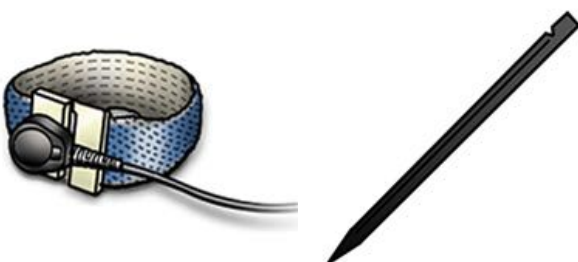
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



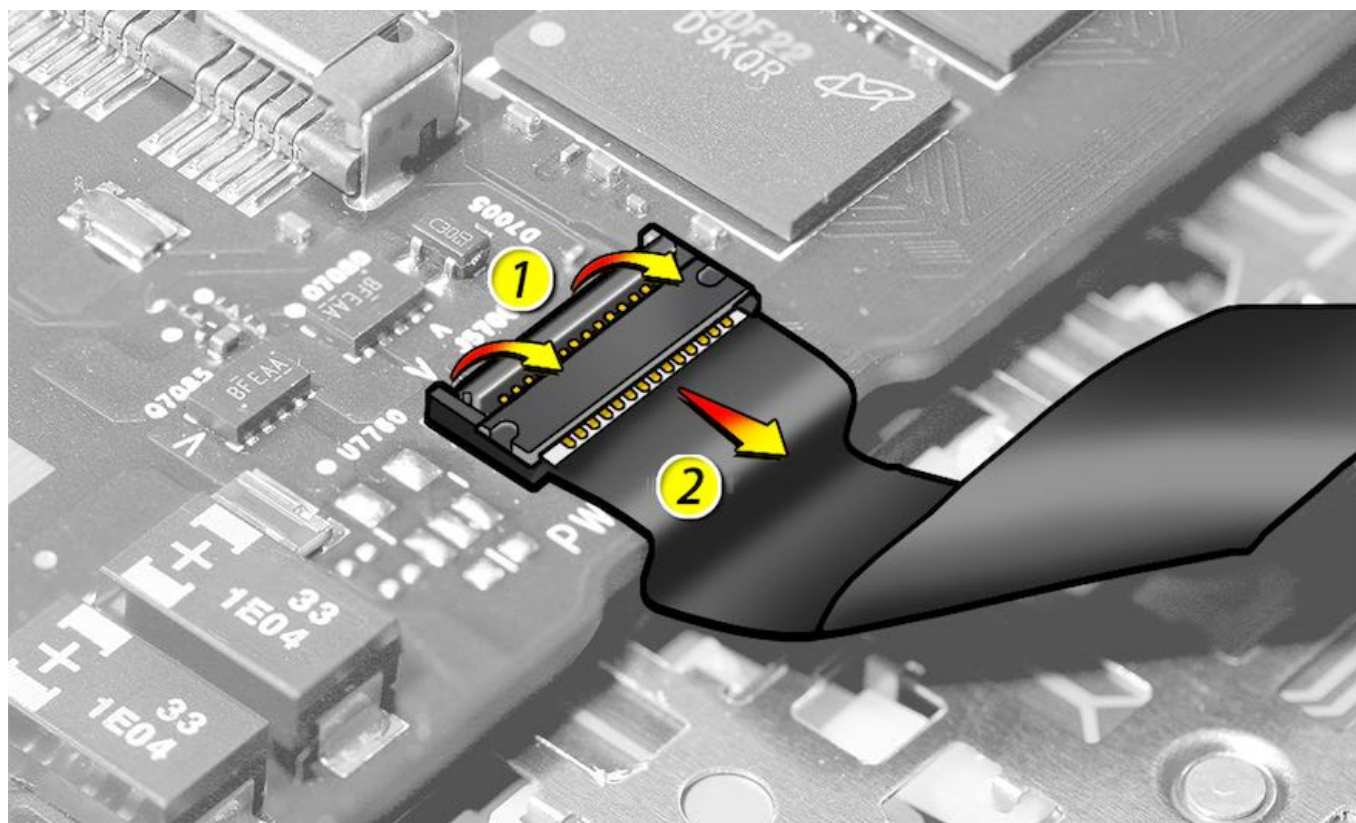
Tools

- ESD wrist strap
- Black stick

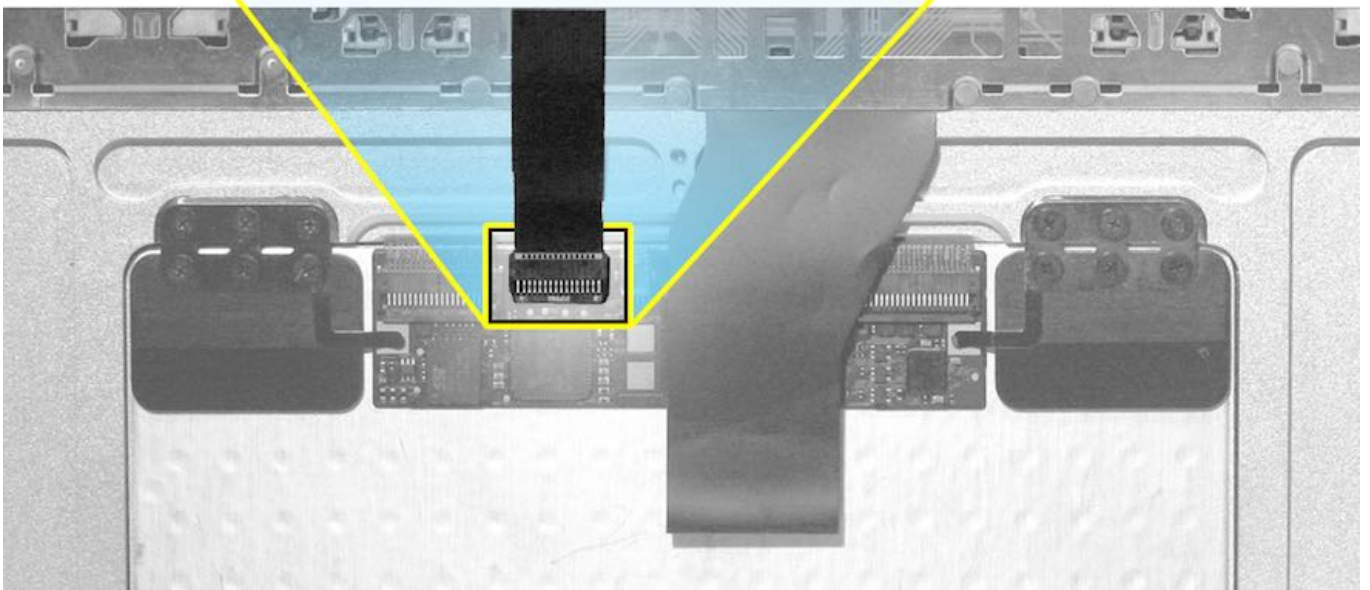
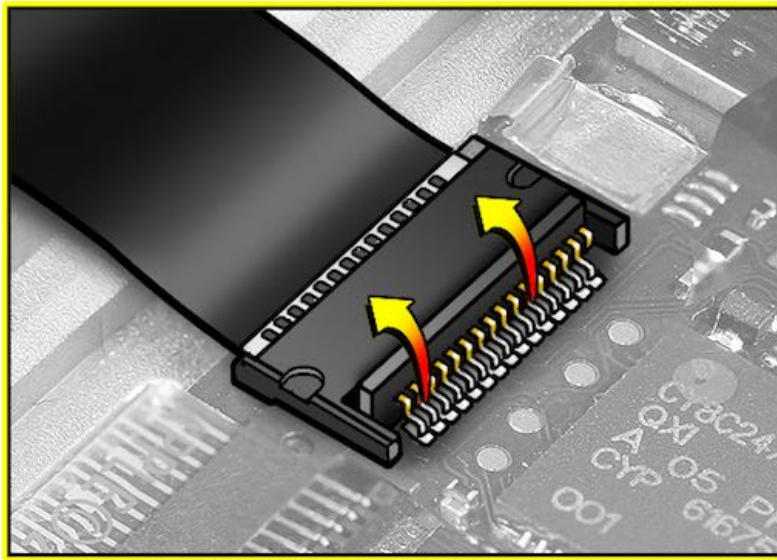


Steps For Removal

1. Disconnect cable from locking lever connector at logic board.



2. Disconnect cable from locking lever connector at trackpad.



Steps For Reassembly

Replacement Note: When installing new cable, peel off adhesive backing on back of cable. Press gently to adhere cable to top case.

MacBook Air (13-inch, Mid 2011, Mid 2012, Mid 2013, Early 2014): Input Device (IPD) Flex Cable

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV165: IPD Flex Replacement Video](#).

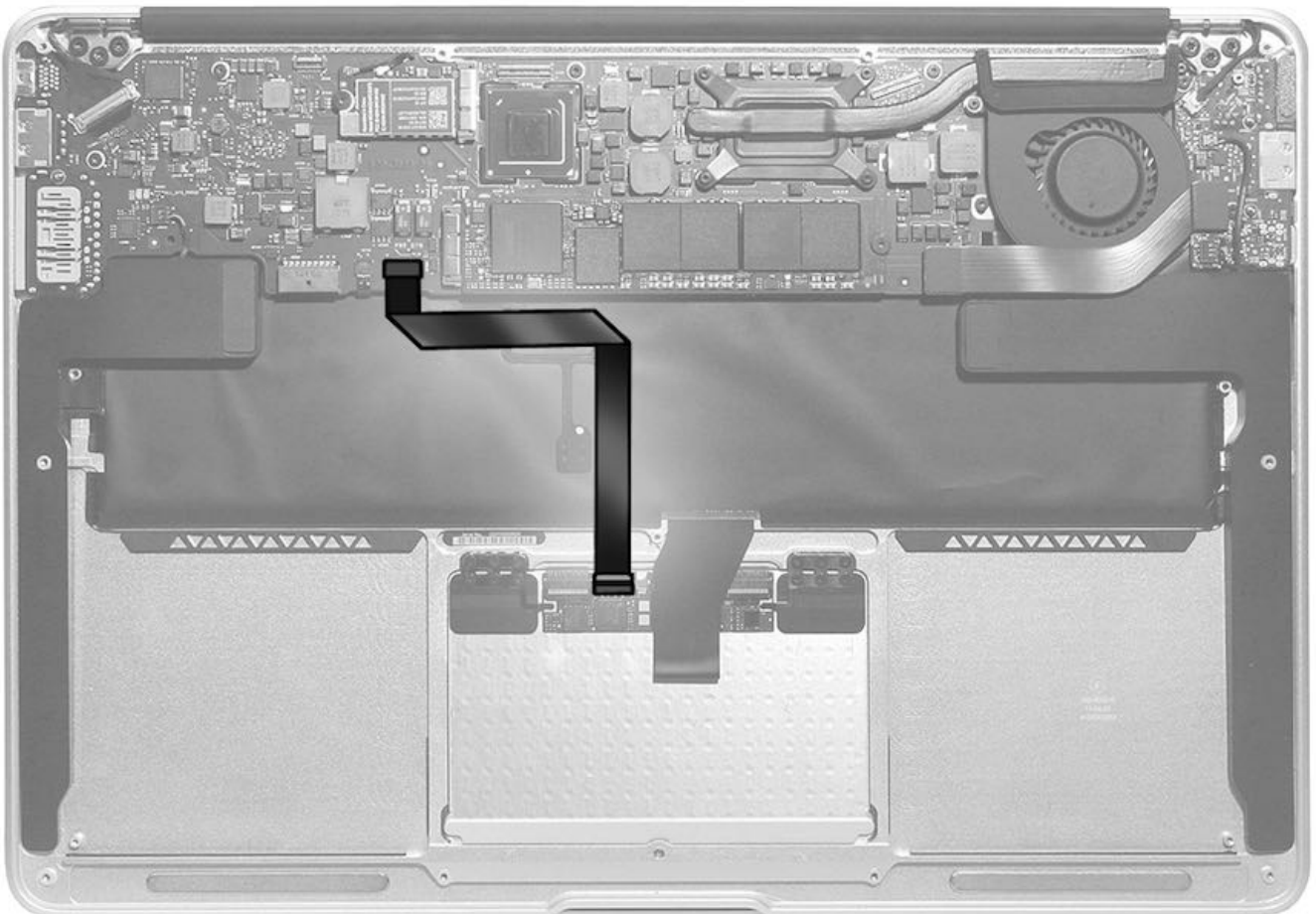
Remove:

- [Bottom Case](#)
- [Battery](#)



Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



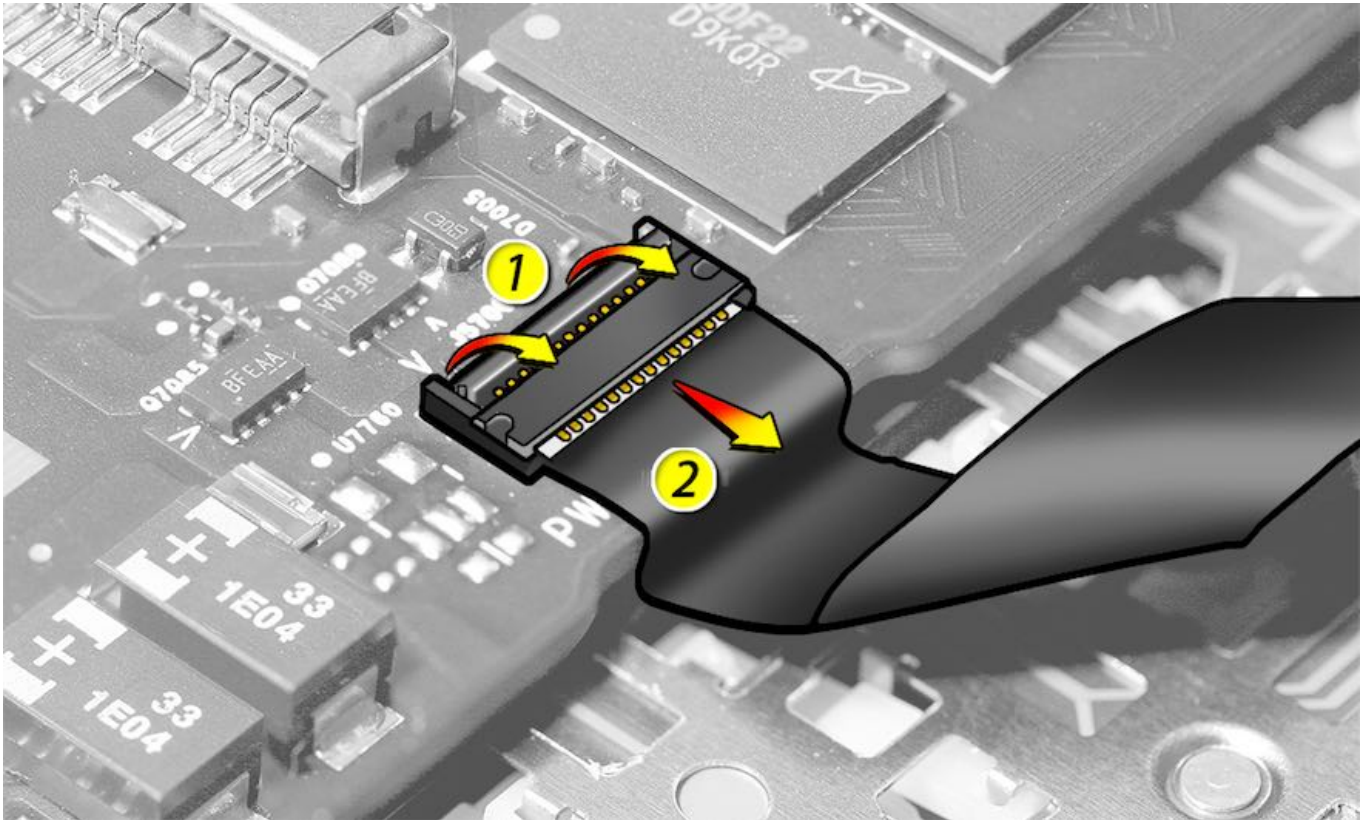
Tools

- ESD wrist strap
- Black stick

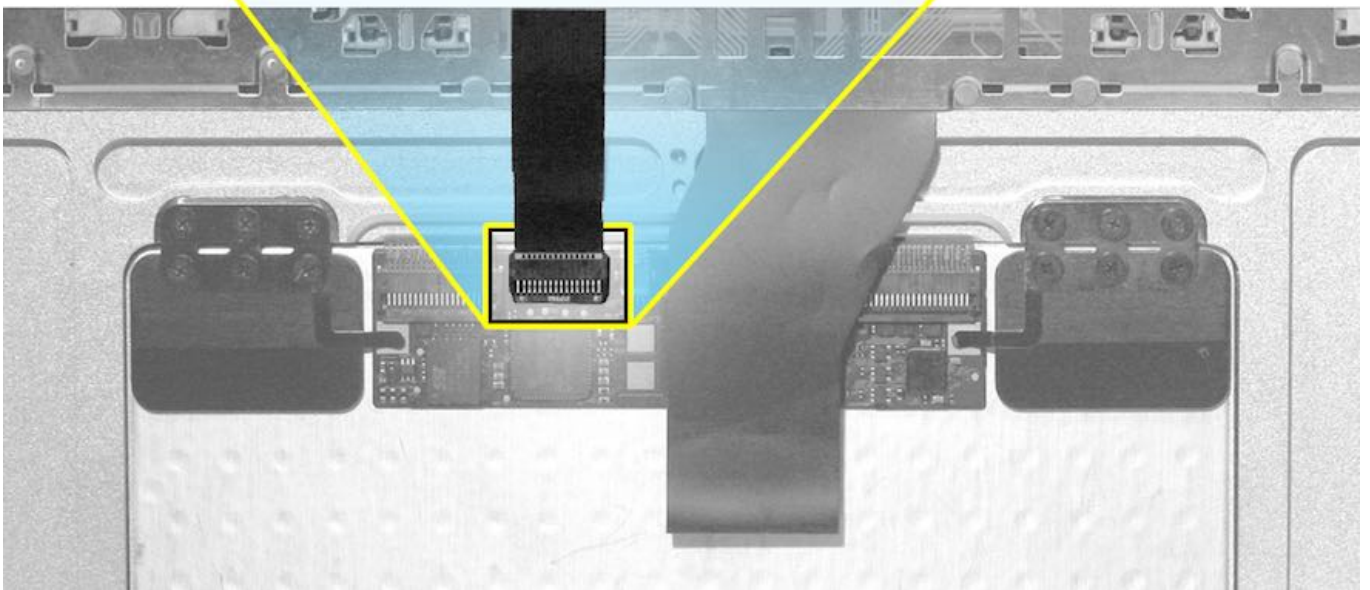
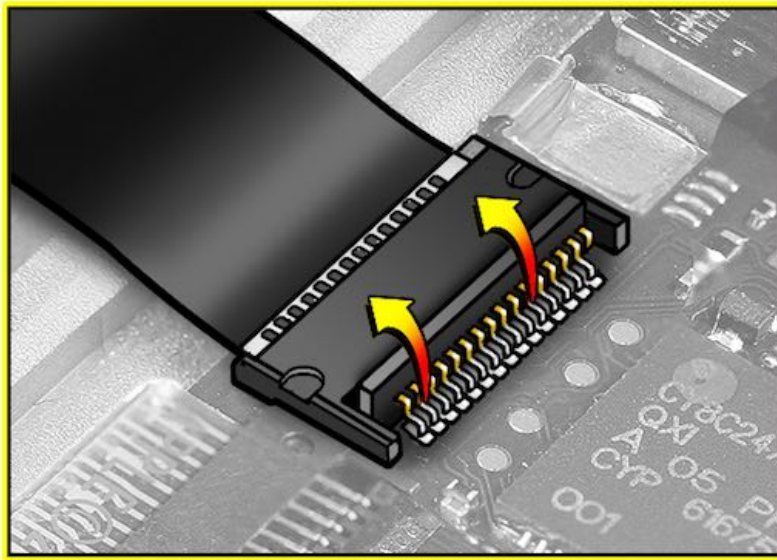


Steps For Removal

1. Disconnect cable from locking lever connector at logic board.



2. Disconnect cable from locking lever connector at trackpad.



Steps For Reassembly

Replacement Note: When installing new cable, peel off adhesive backing on back of cable. Press gently to adhere cable to top case.

MacBook Air (13-inch, Late 2010): Heat Sink Thermal Module

First Steps

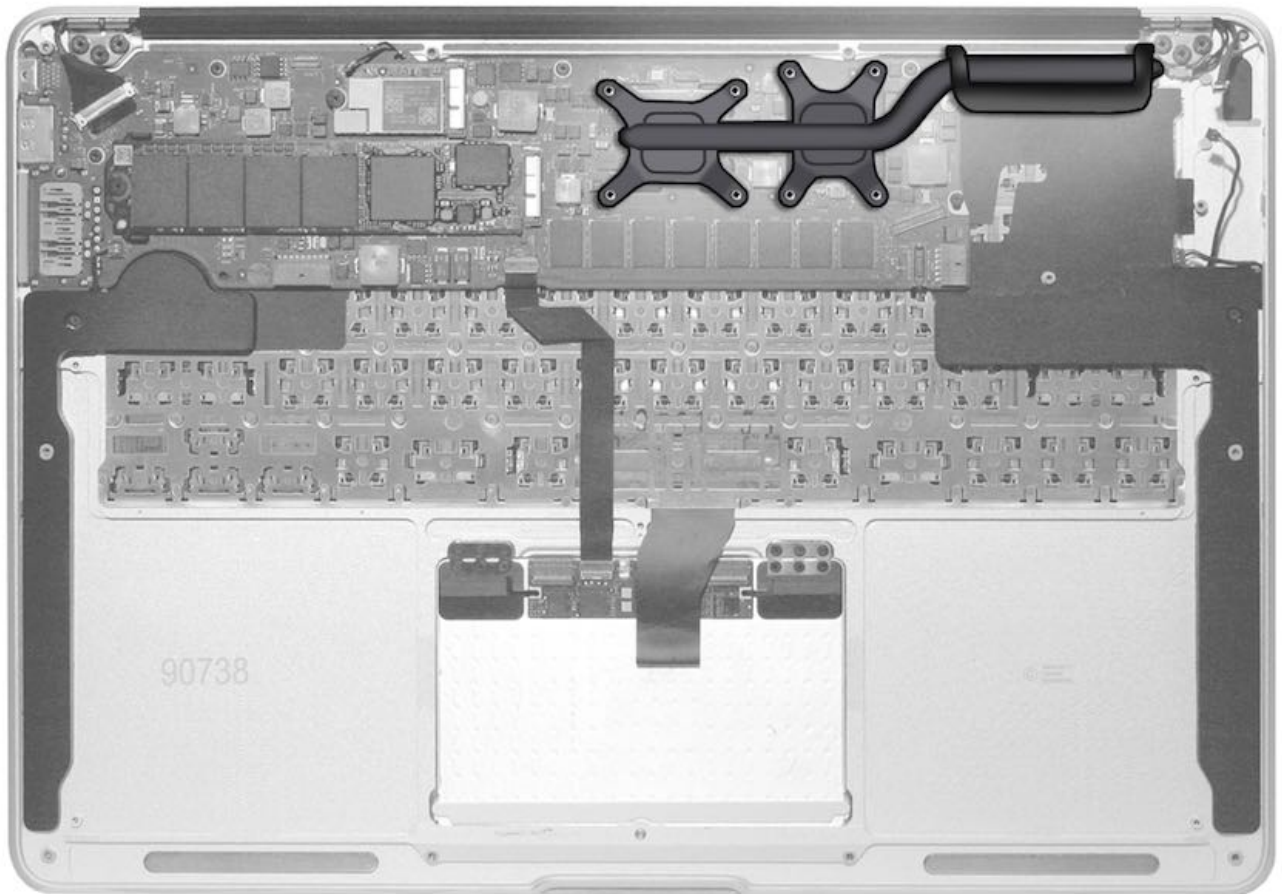
Remove:

- [Bottom Case](#)
- [Battery](#)
- [I/O Flex Cable](#)
- [Fan](#)
- [I/O Board](#)



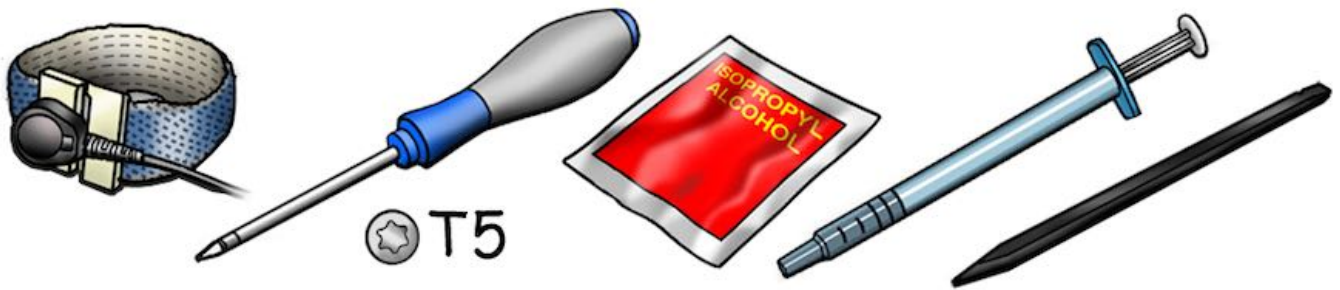
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Torx T5 screwdriver, magnetized
- Alcohol pads
- Thermal grease syringe (922-7144)
- Black stick

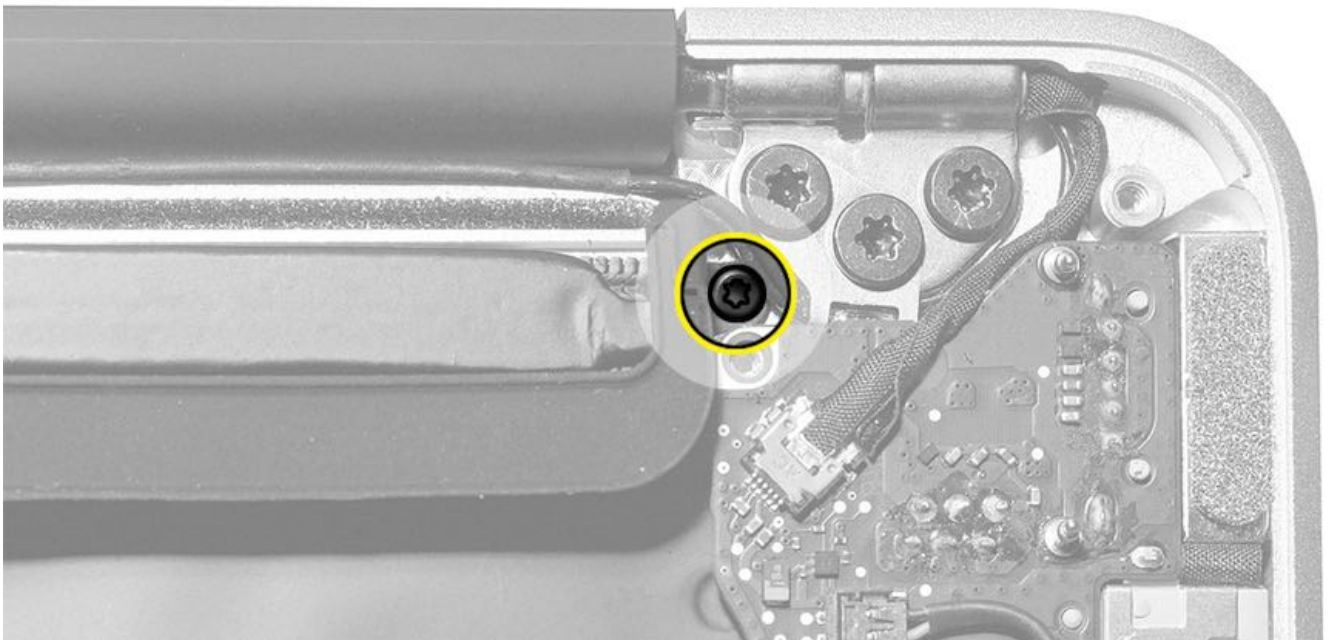


Steps For Removal



Caution: Do not grasp the heat sink arm.

1. Remove 1 Torx #5 screw in the top right corner of heat sink: (1) 922-9655 (2.4 mm)

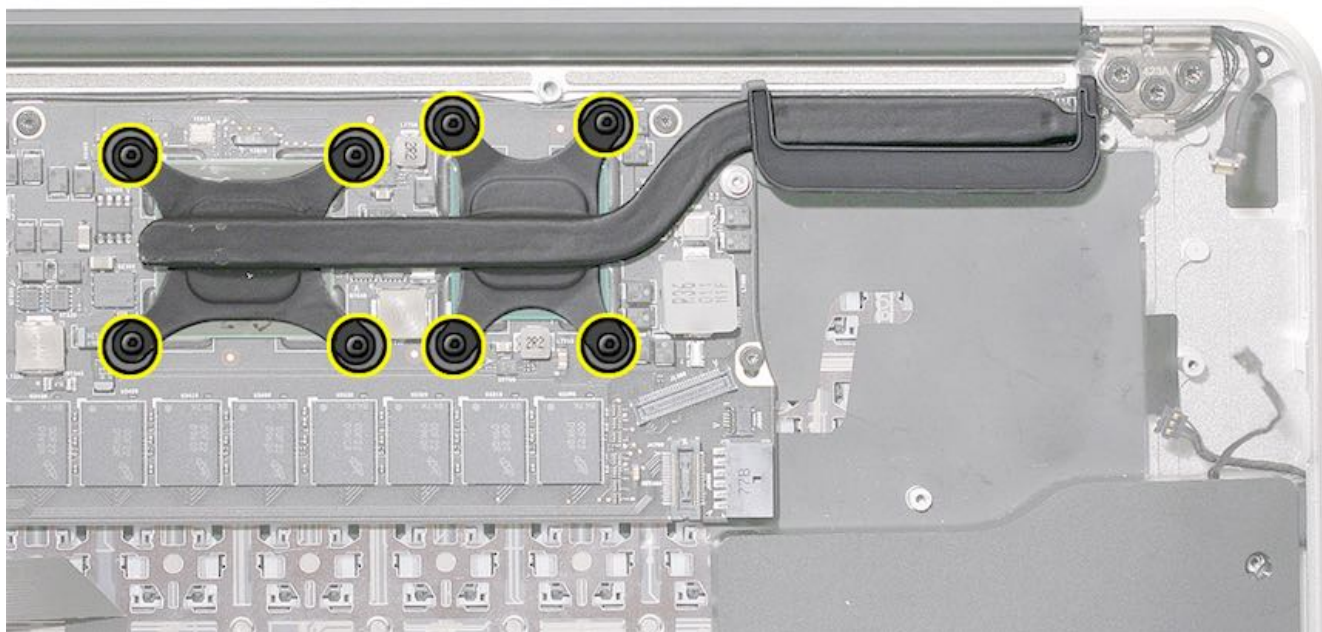


2. **Note:** Thermal rubber gasket stays with heat sink. Take note how gasket wraps around heat sink and attaches to logic board before removing heat sink.

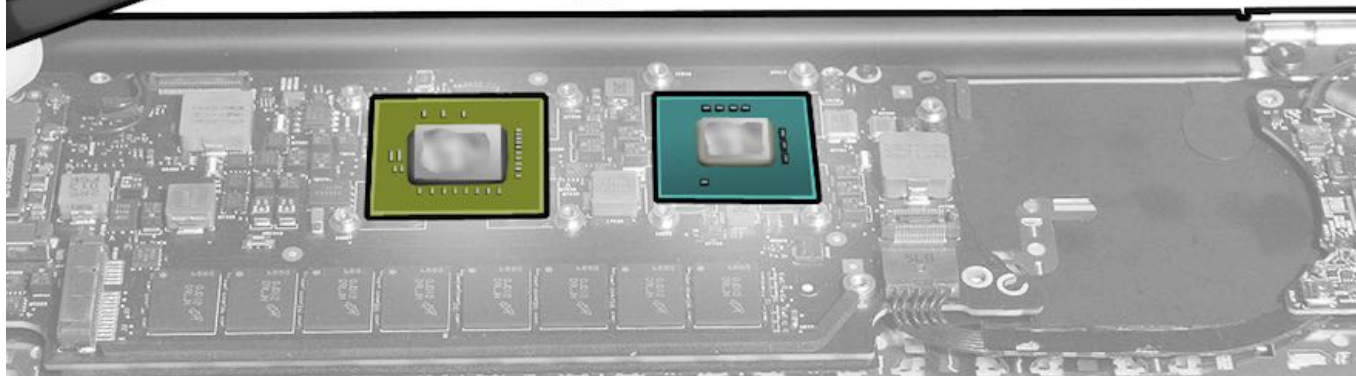
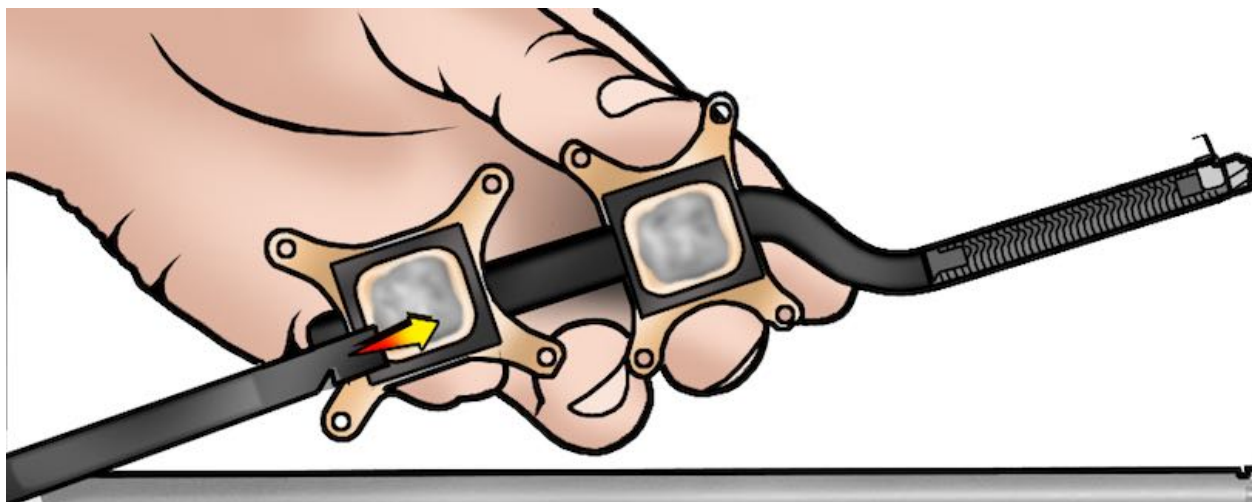


3. Remove 8 Torx #5 screws. (8) 922-9653 (1.8 mm)

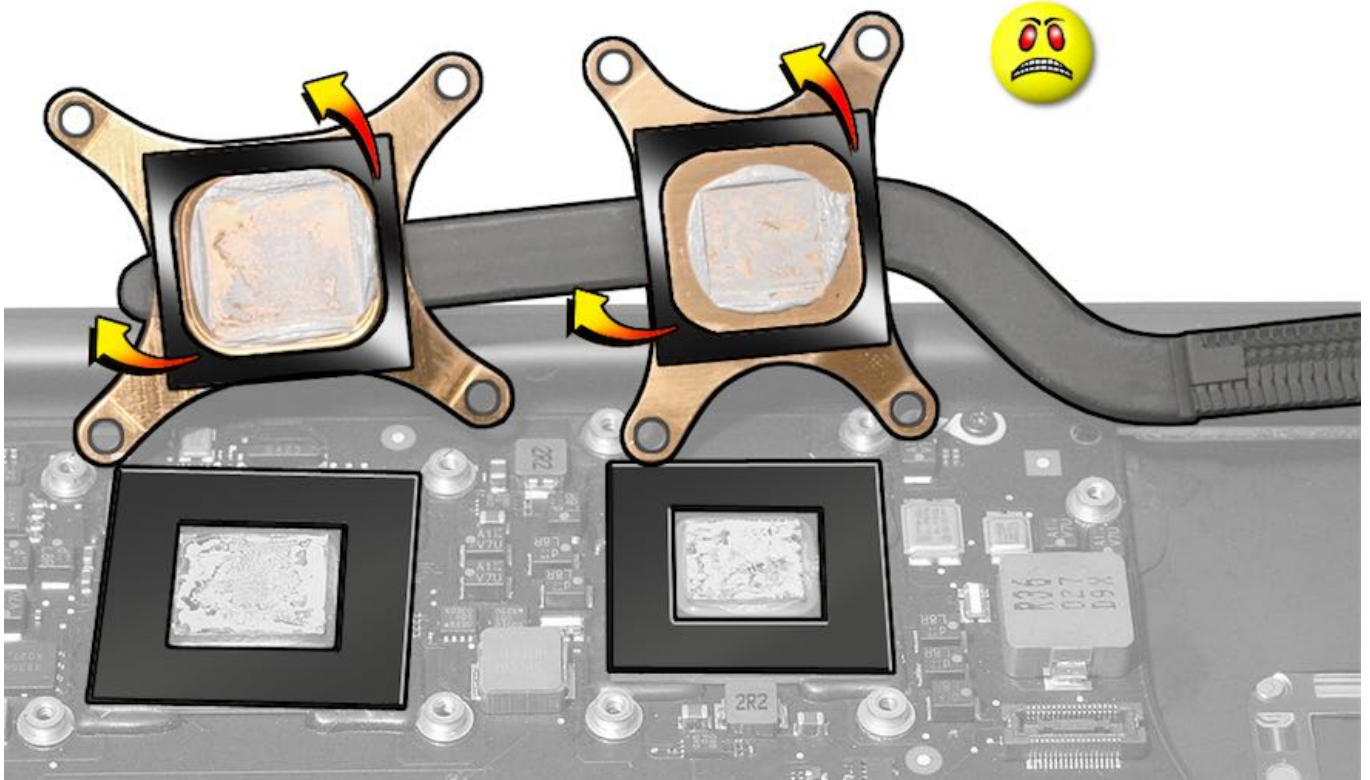
4. Keeping heat sink parallel to logic board, gently wiggle heat sink to loosen bond on logic board and lift heat sink off logic board.



5. Scrape off thermal grease and use alcohol pad to clean thermal pads and chips.



6. If heat sink has mylar frames, use a black stick to remove the mylar.

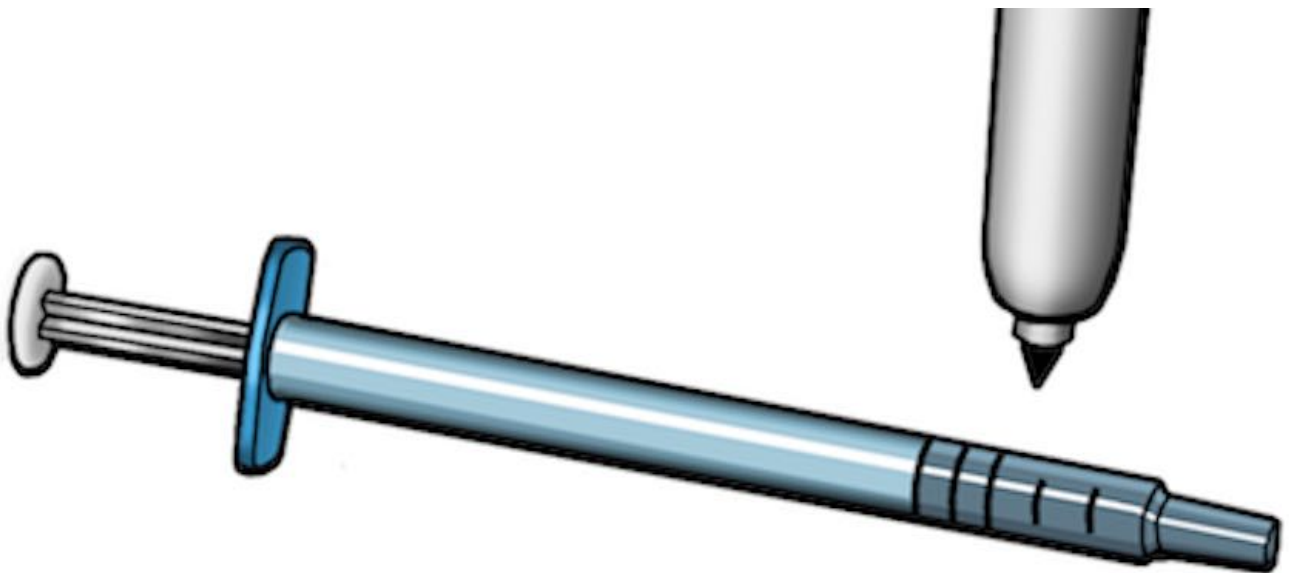


Steps For Reassembly

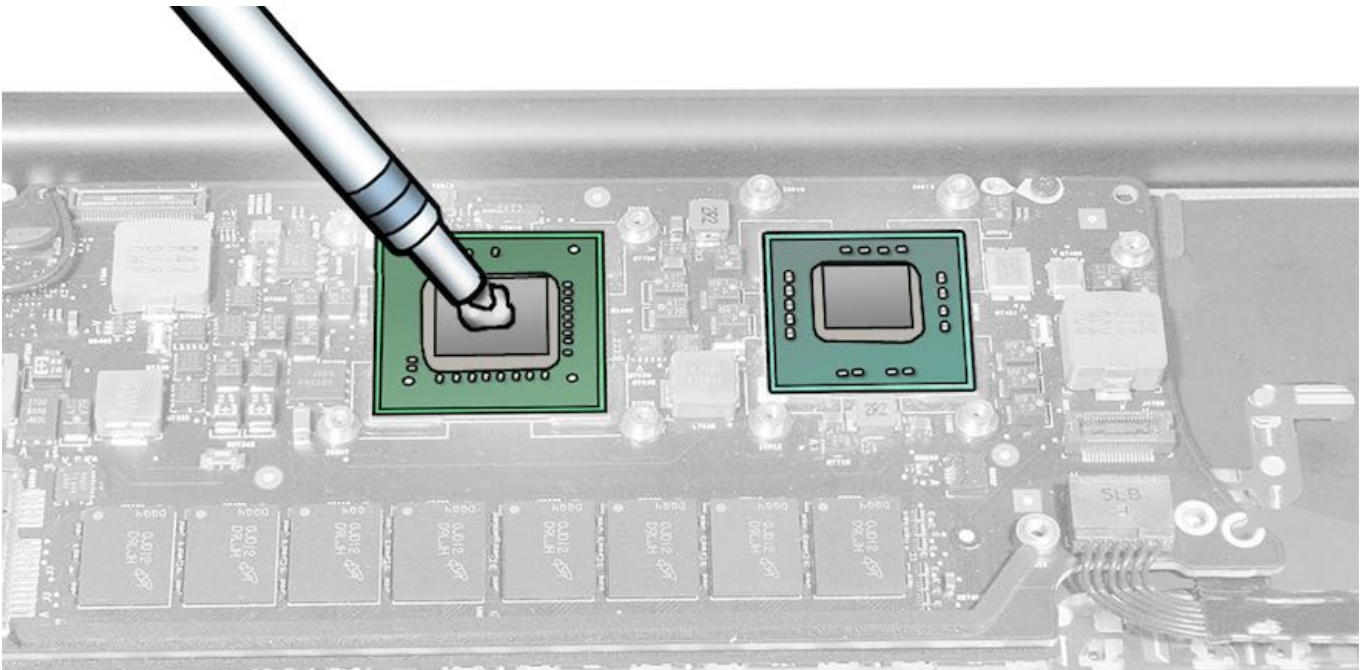
1. Use a pen to mark the syringe in thirds.



Caution: Syringe (922-7144) contains enough thermal grease for 3 chips. Because this computer has only 2 chips, use only 2/3 of syringe contents.

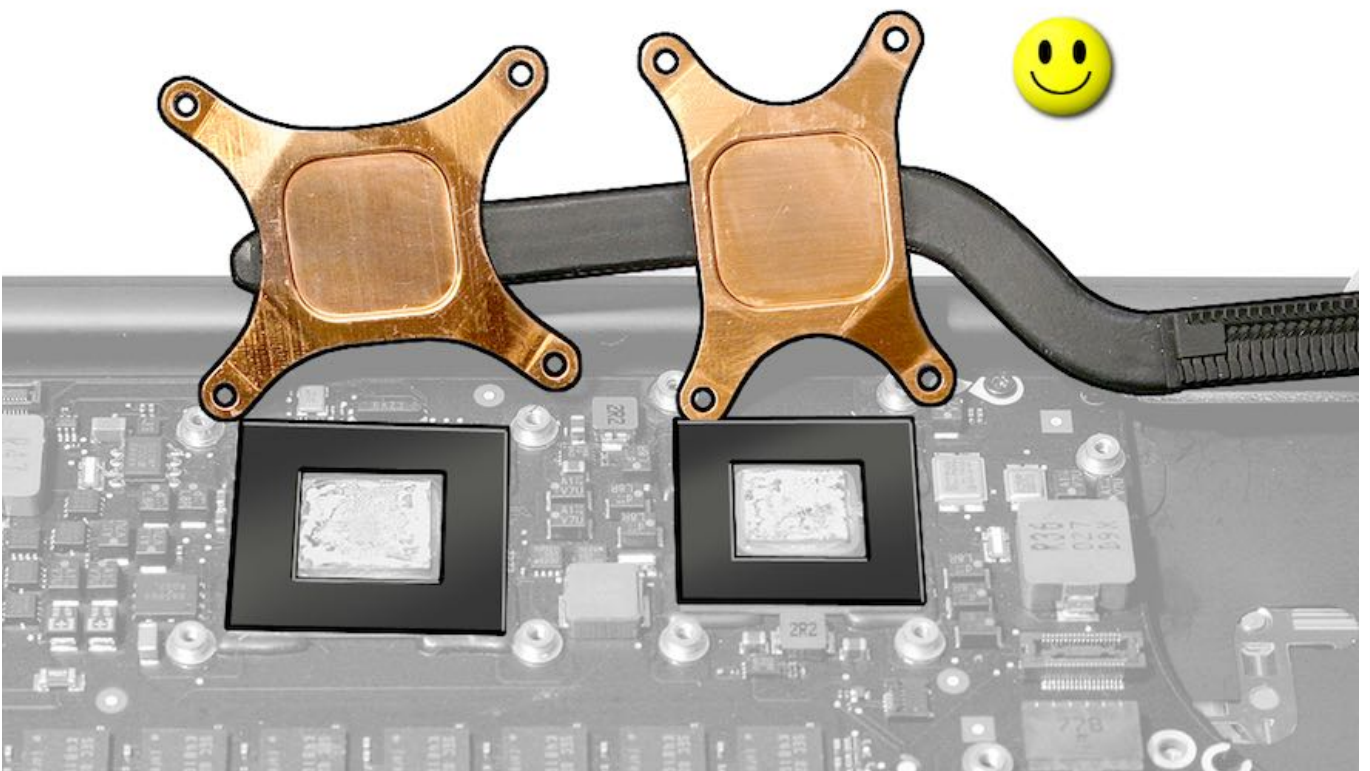


2. Inject 1/3 of grease on each chip.

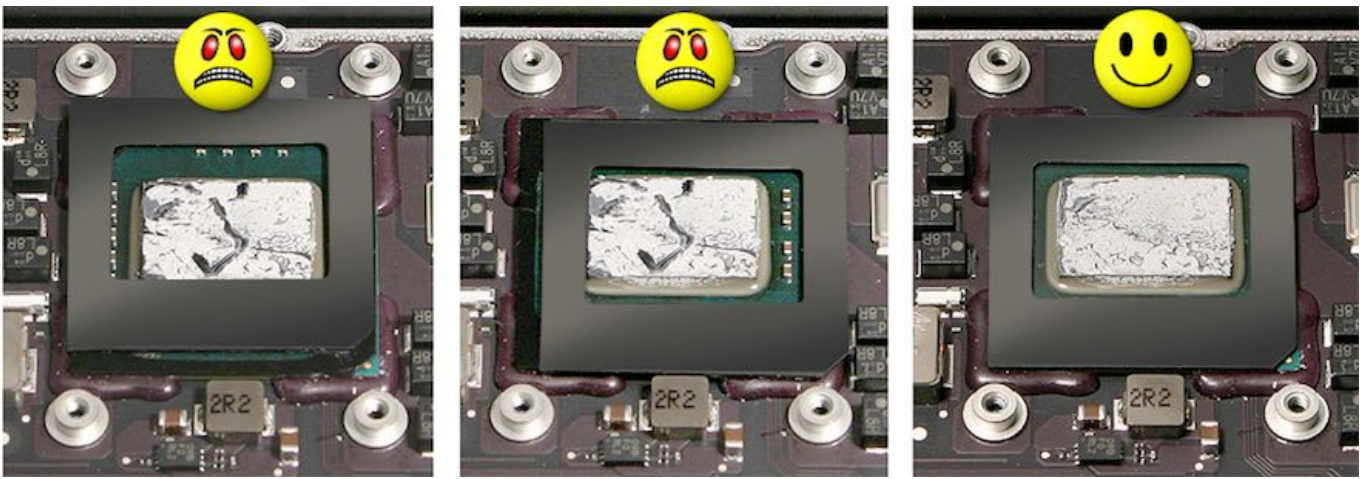


3. If logic board does not have mylar frames, install them over the MCP (Media Core Processor) and CPU chips.

Note: Mylar frames are included with replacement heat sink (076-1375).



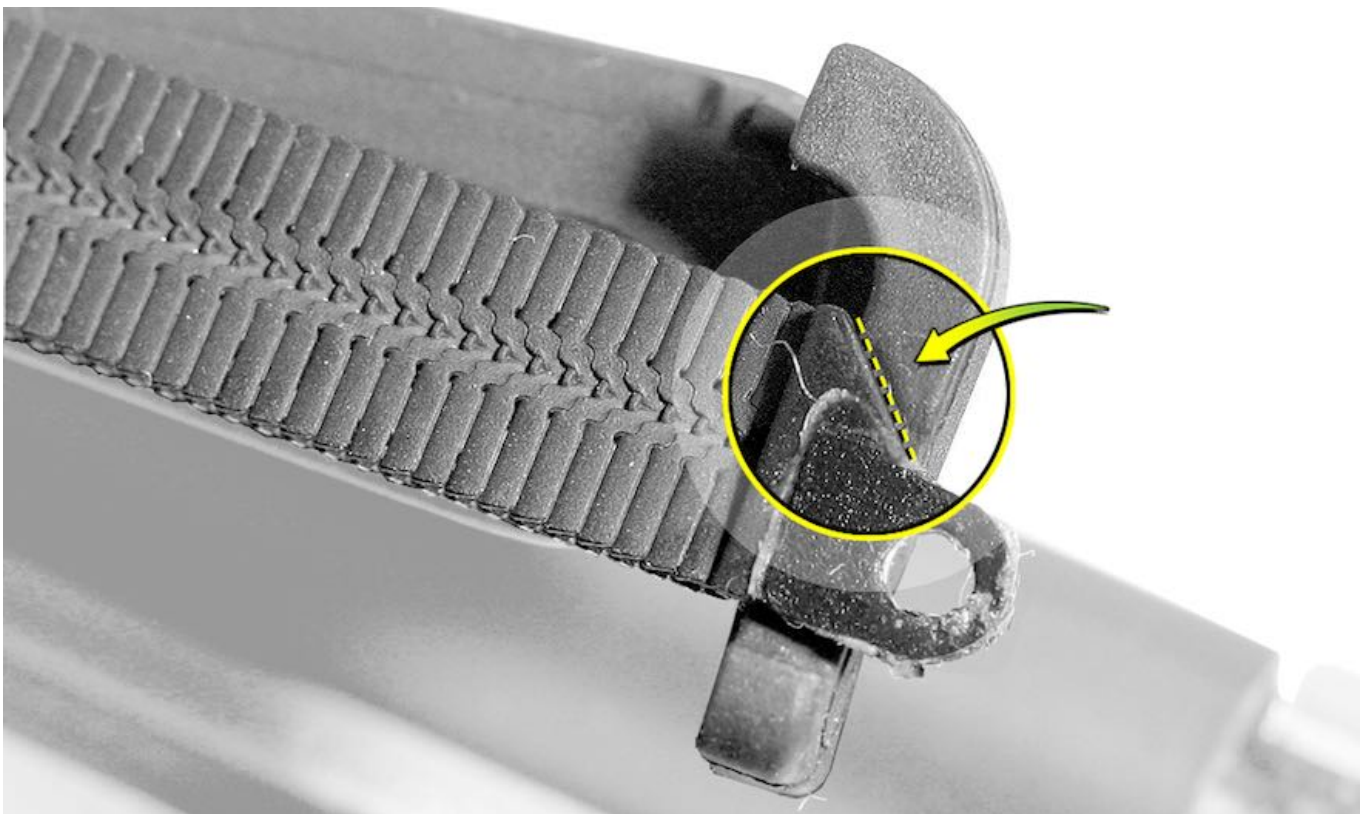
4. Make sure mylar frame is centered over chip and covers the tiny capacitors. Do not press too hard or the capacitors may be damaged.



5. Assemble thermal rubber gasket onto heat sink.

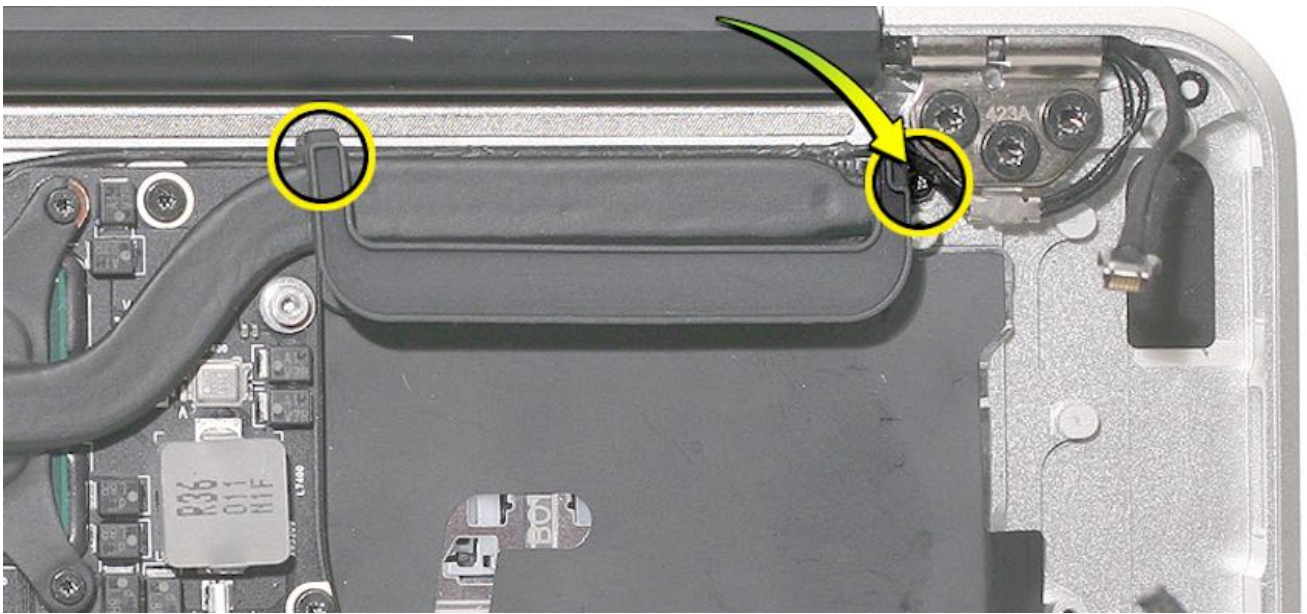


6. Align edge of heat sink with indent on thermal gasket (shown by the dotted line, on the underside of the thermal gasket).



7. Carefully turn heat sink and thermal gasket over.

- Align gasket nub into hole on logic board.
- Align heat sink screw to screw hole in top case.

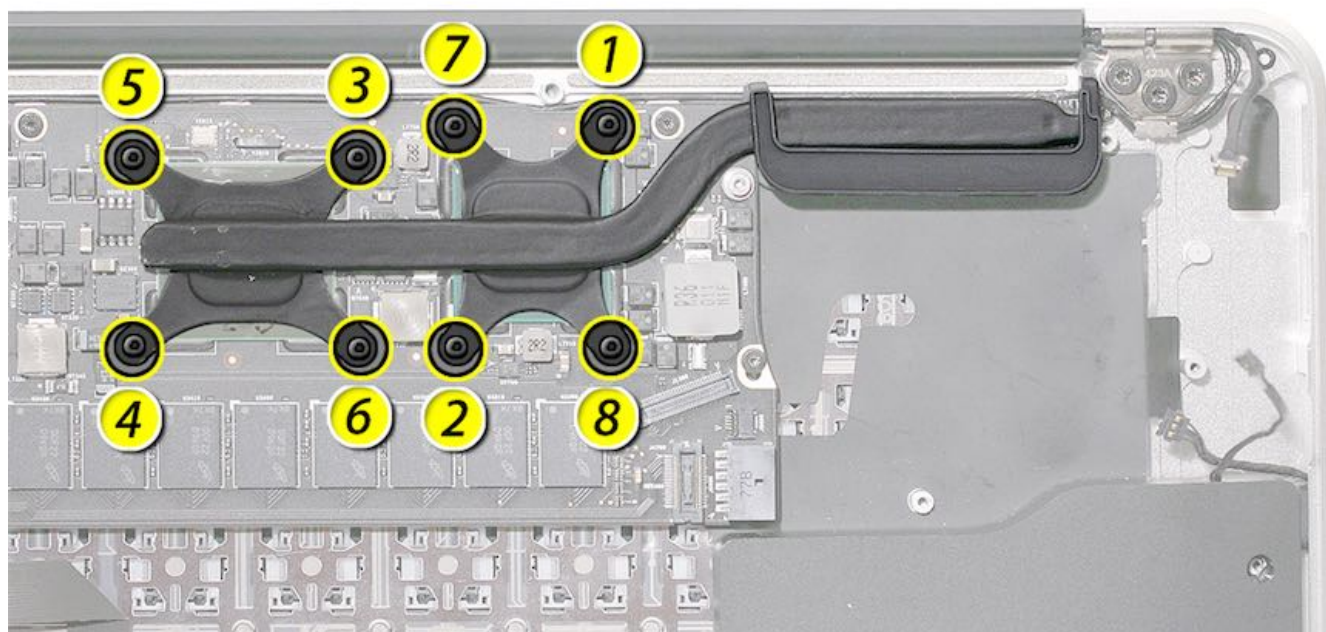


8. Tighten heat sink screw once thermal gasket is seated properly.

Note: Be careful not to clip or damage AirPort/Bluetooth cable when reinstalling screw.



9. Replace remaining screws in order shown. Install screws 1/2 way first; then tighten in order shown.



MacBook Air (13-inch, Mid 2011, Mid 2012): Heat Sink Thermal Module

First Steps

For video instruction, refer to Apple Support article [SV174: Heat Sink Replacement Video](#).

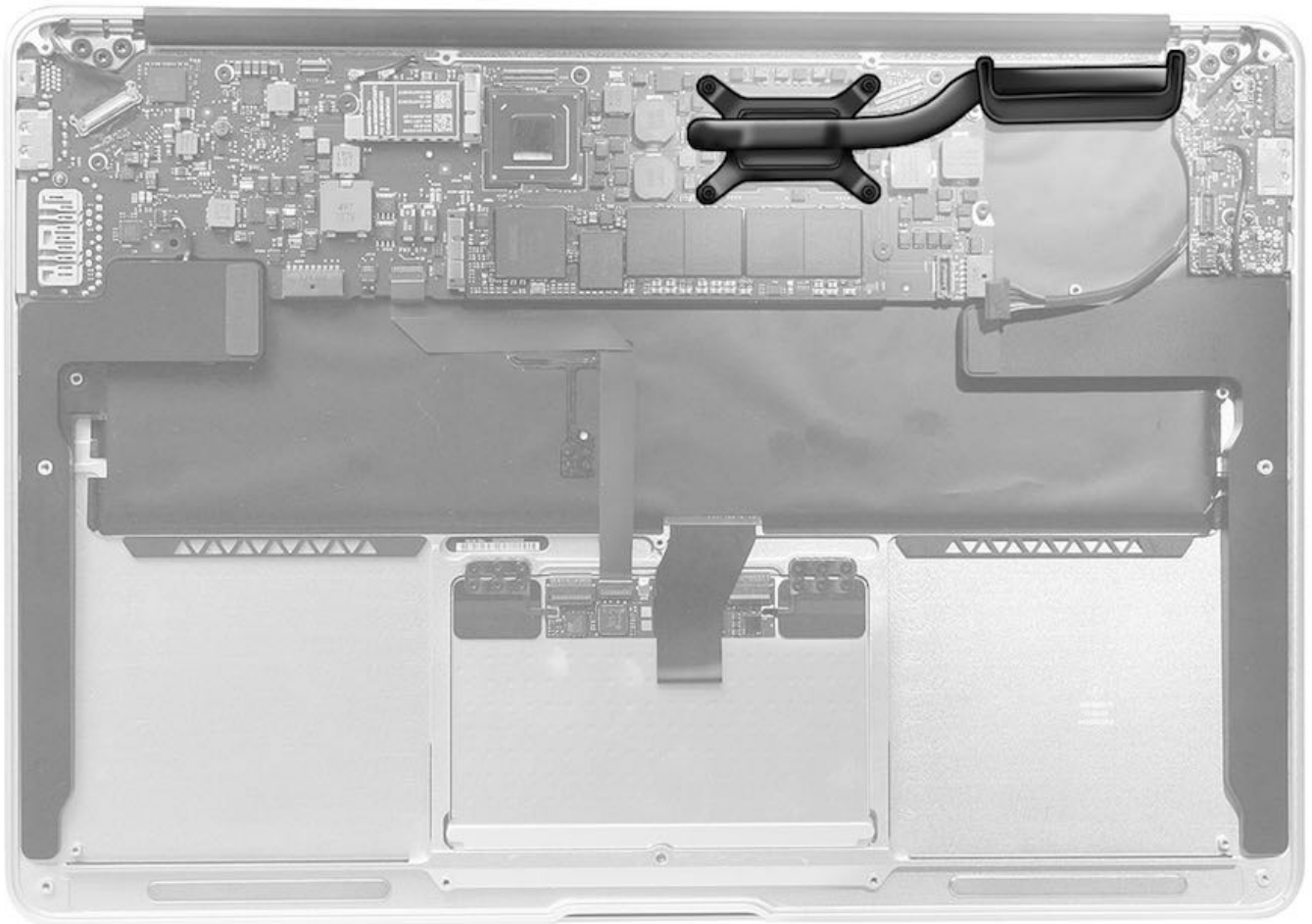
Remove:

- [Bottom Case](#)
- [I/O Flex Cable](#)
- [Fan](#)



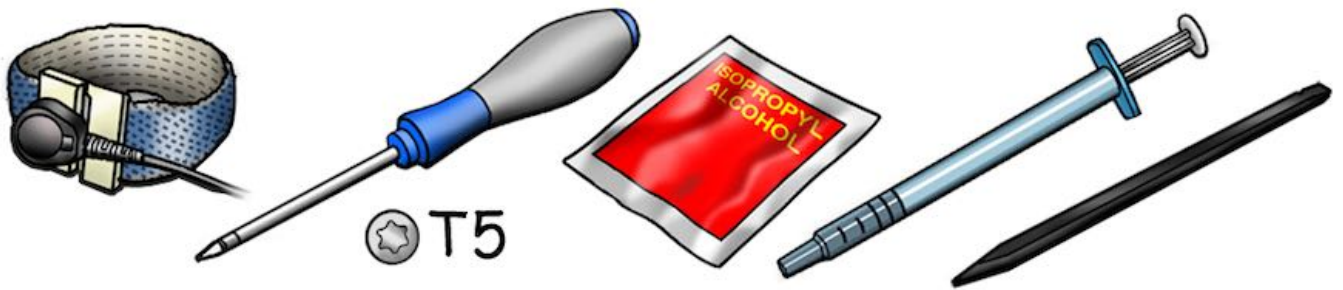
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Torx T5 screwdriver, magnetized
- Alcohol pads
- Thermal grease syringe (922-7144)
- Black stick

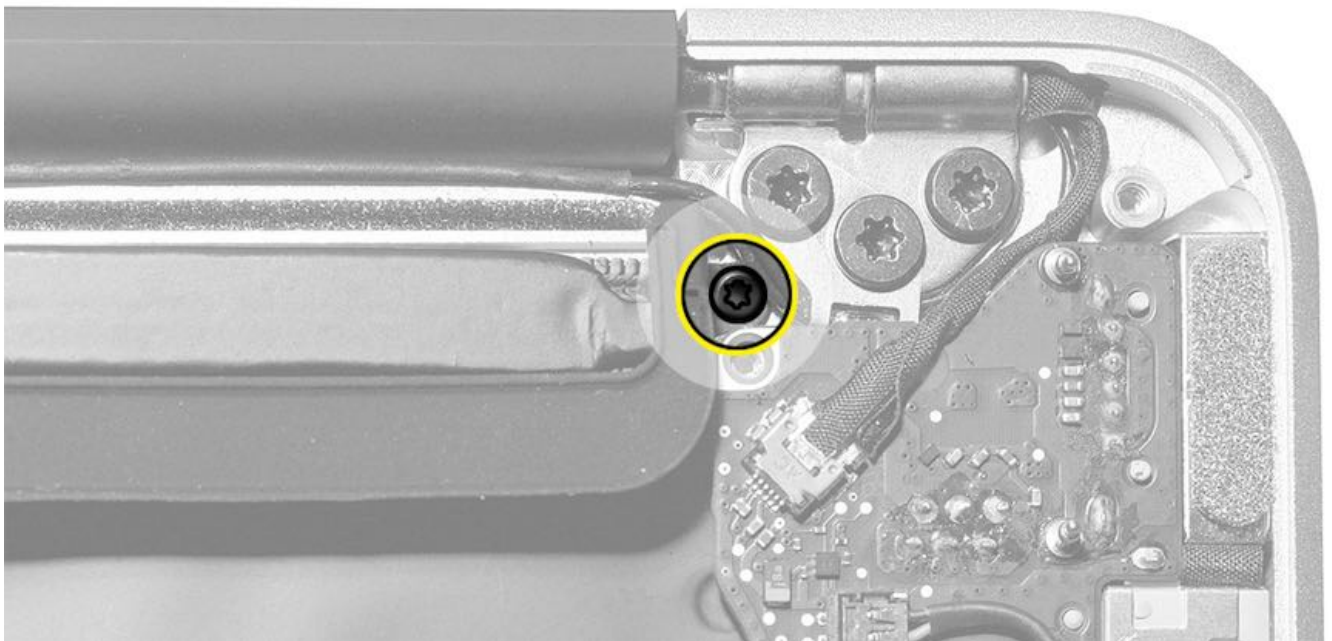


Steps For Removal



Caution: Do not grasp the heat sink arm.

1. Remove 1 Torx #5 screw in the top right corner of heat sink: (1) 922-9655 (2.4 mm)

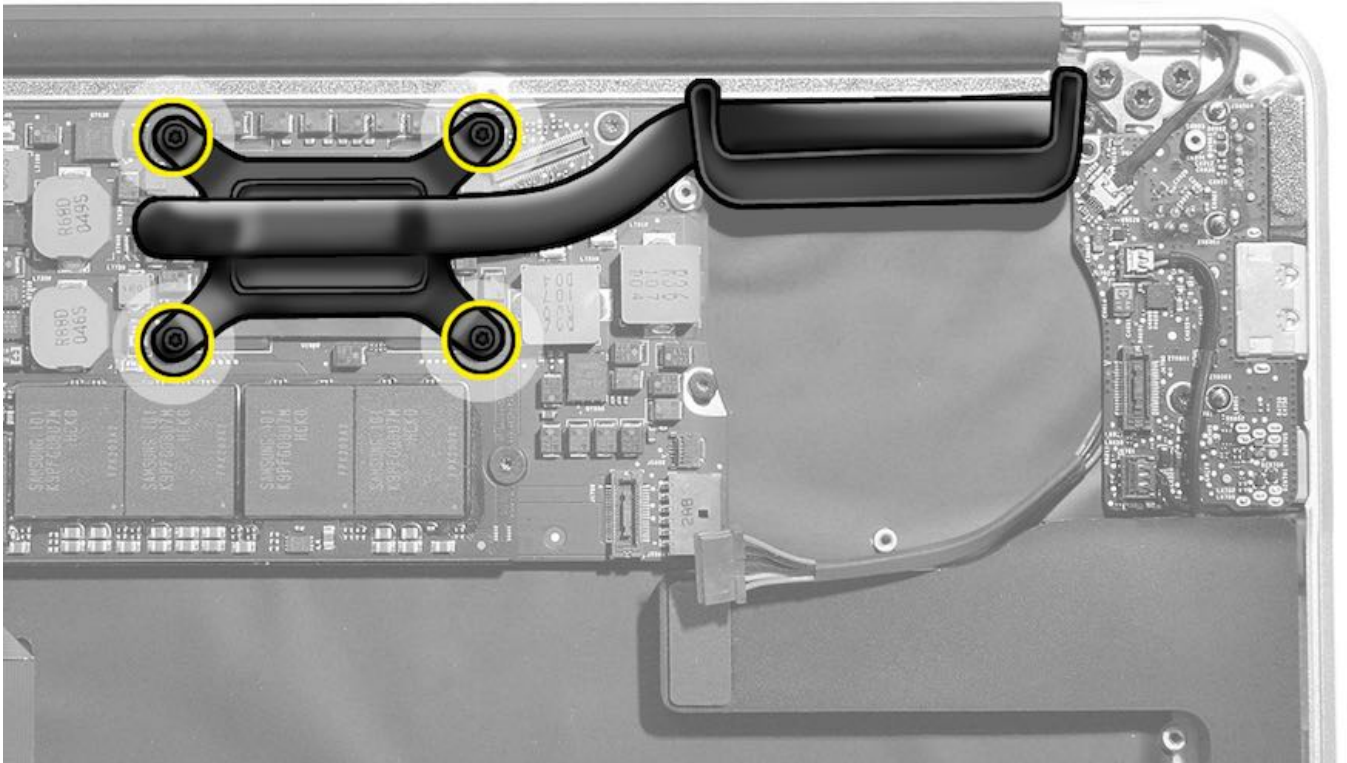


2. **Note:** Thermal rubber gasket stays with heat sink. Take note how gasket wraps around heat sink and attaches to logic board before removing heat sink.



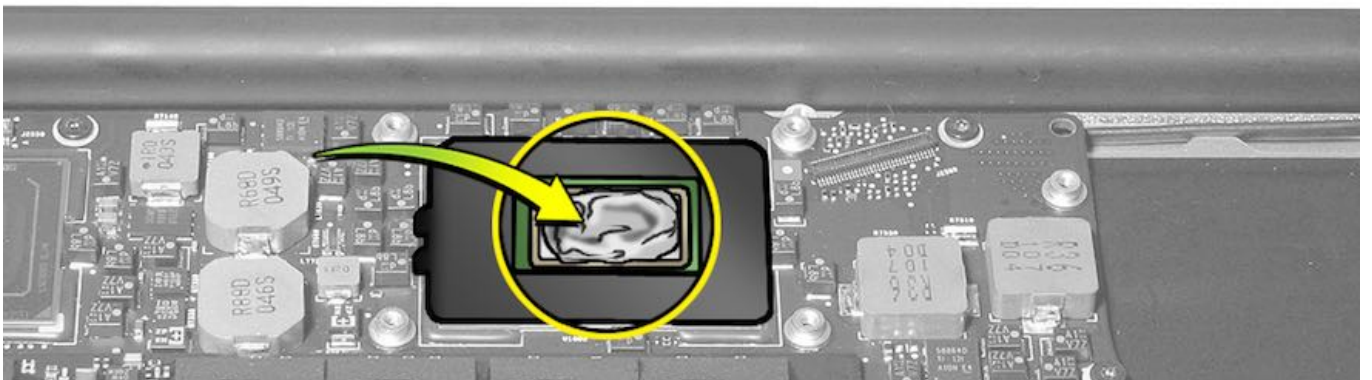
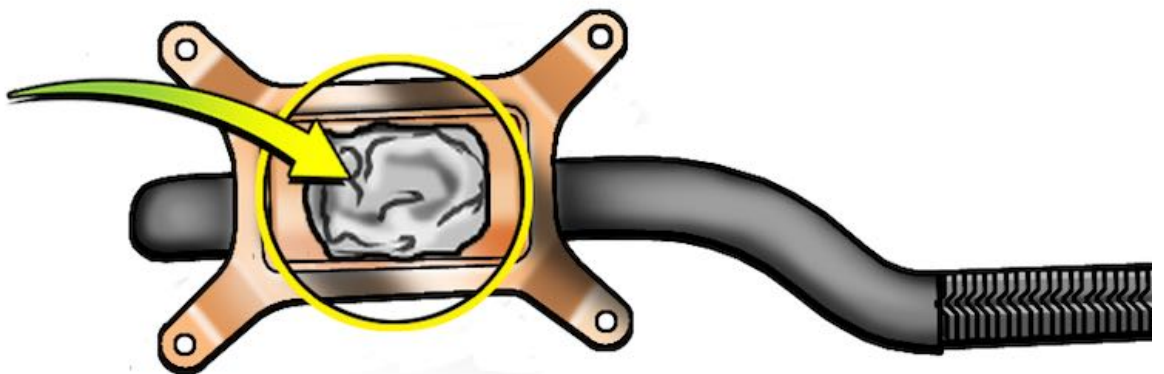
3. Remove 4 Torx #5 screws. (8) 922-9653 (1.8 mm)

4. Keeping heat sink parallel to logic board, gently wiggle heat sink to loosen bond on logic board and lift heat sink off logic board.



5. Scrape off thermal grease and use alcohol pad to clean thermal pads and chips.

6. If heat sink has mylar frames, use a black stick to remove the mylar.

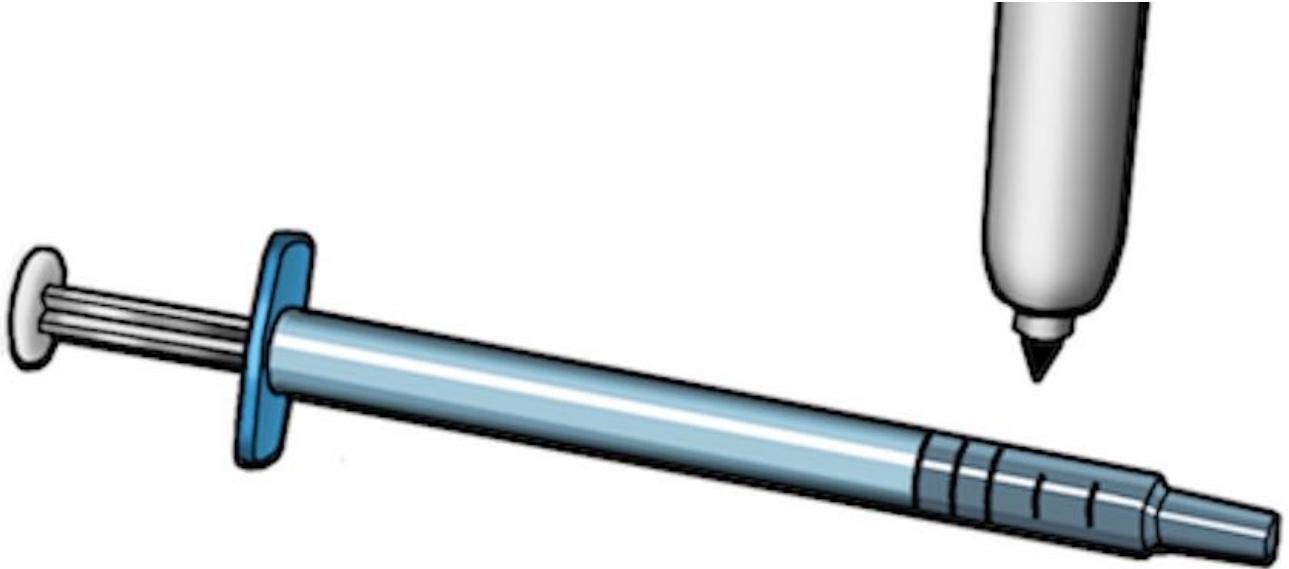


Steps For Reassembly

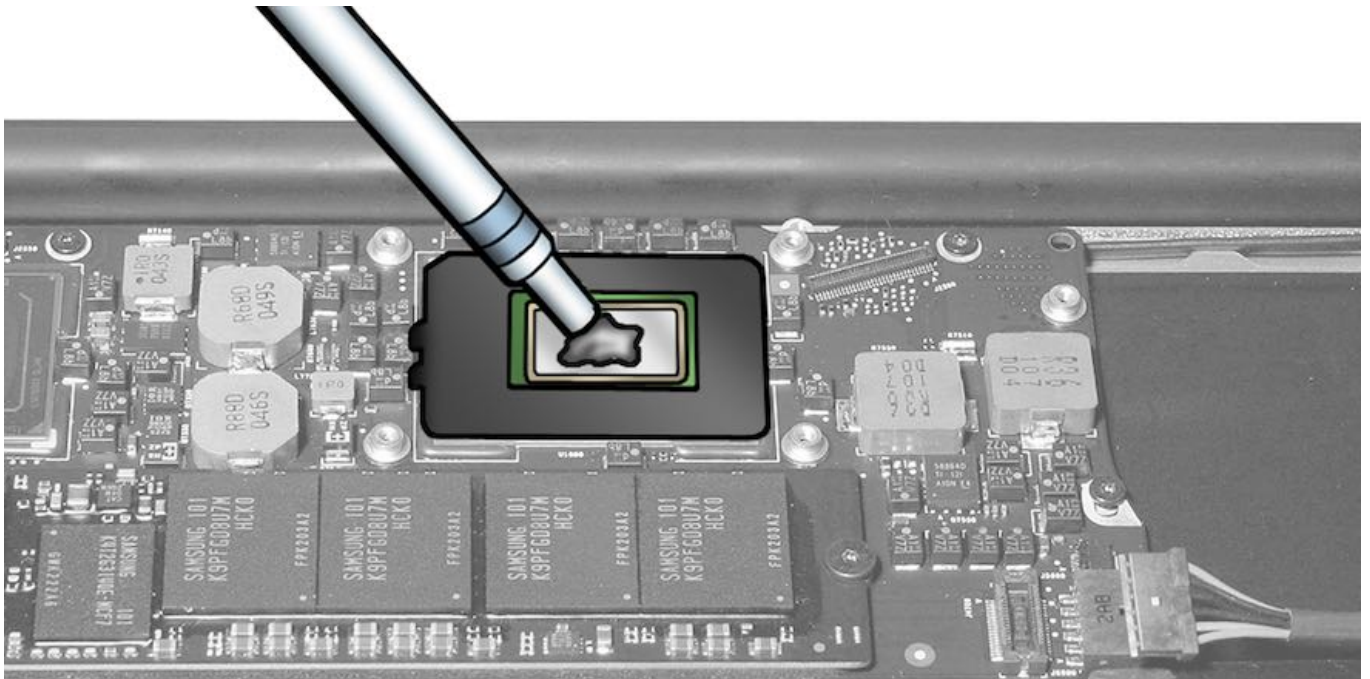
1. Use a pen to mark the syringe in thirds.



Caution: Syringe (922-7144) contains enough thermal grease for 3 chips. Because this computer has only 1 chip, use only 1/3 of syringe contents.

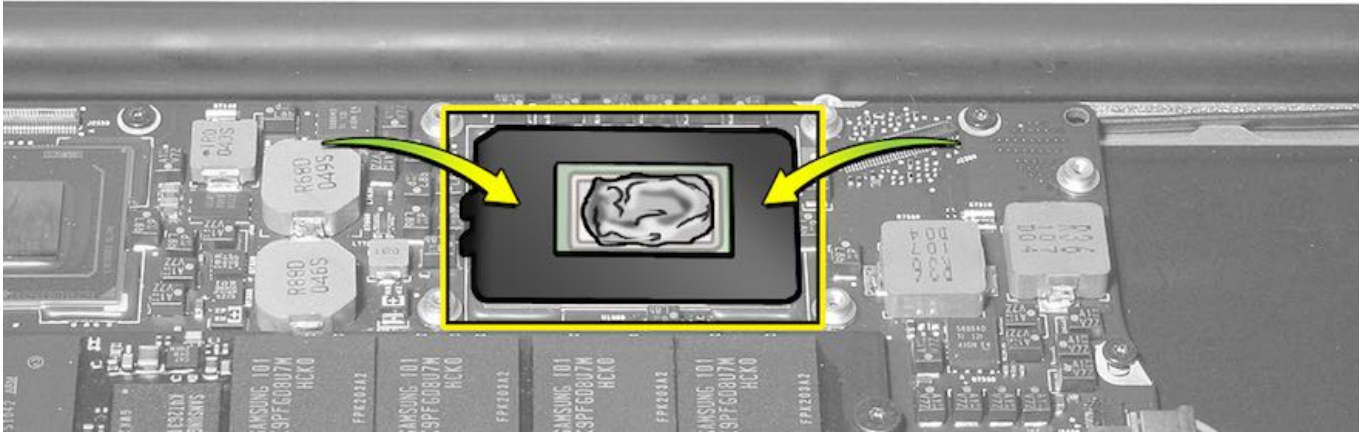
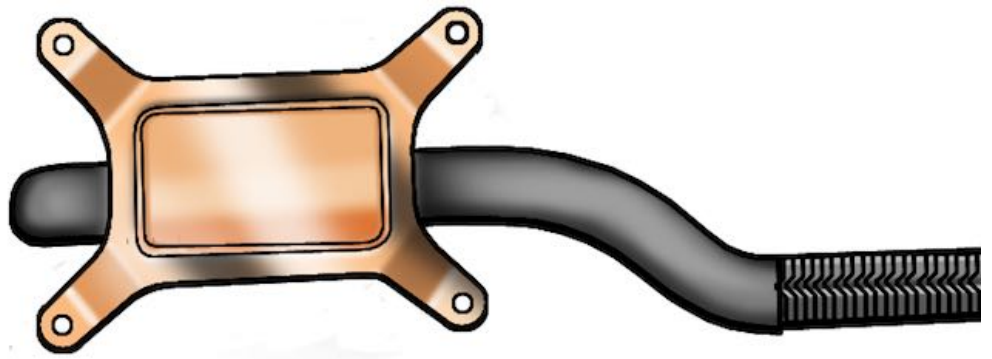


2. Inject 1/3 of grease on each chip.

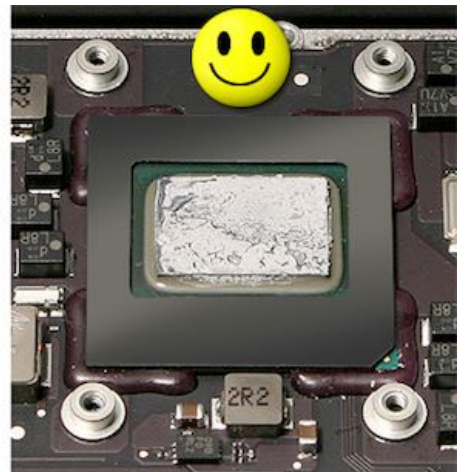
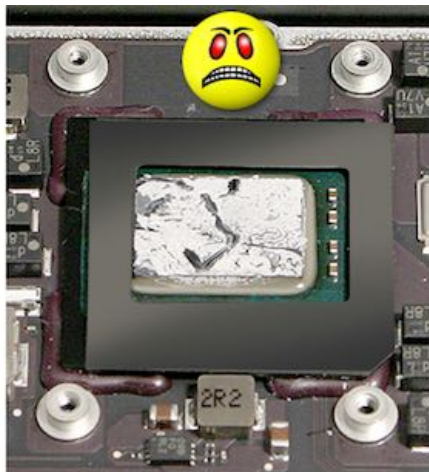


3. If logic board does not have mylar frames, install them over the MCP (Media Core Processor) and CPU chips.

Note: Mylar frames are included with replacement heat sink (076-1375).



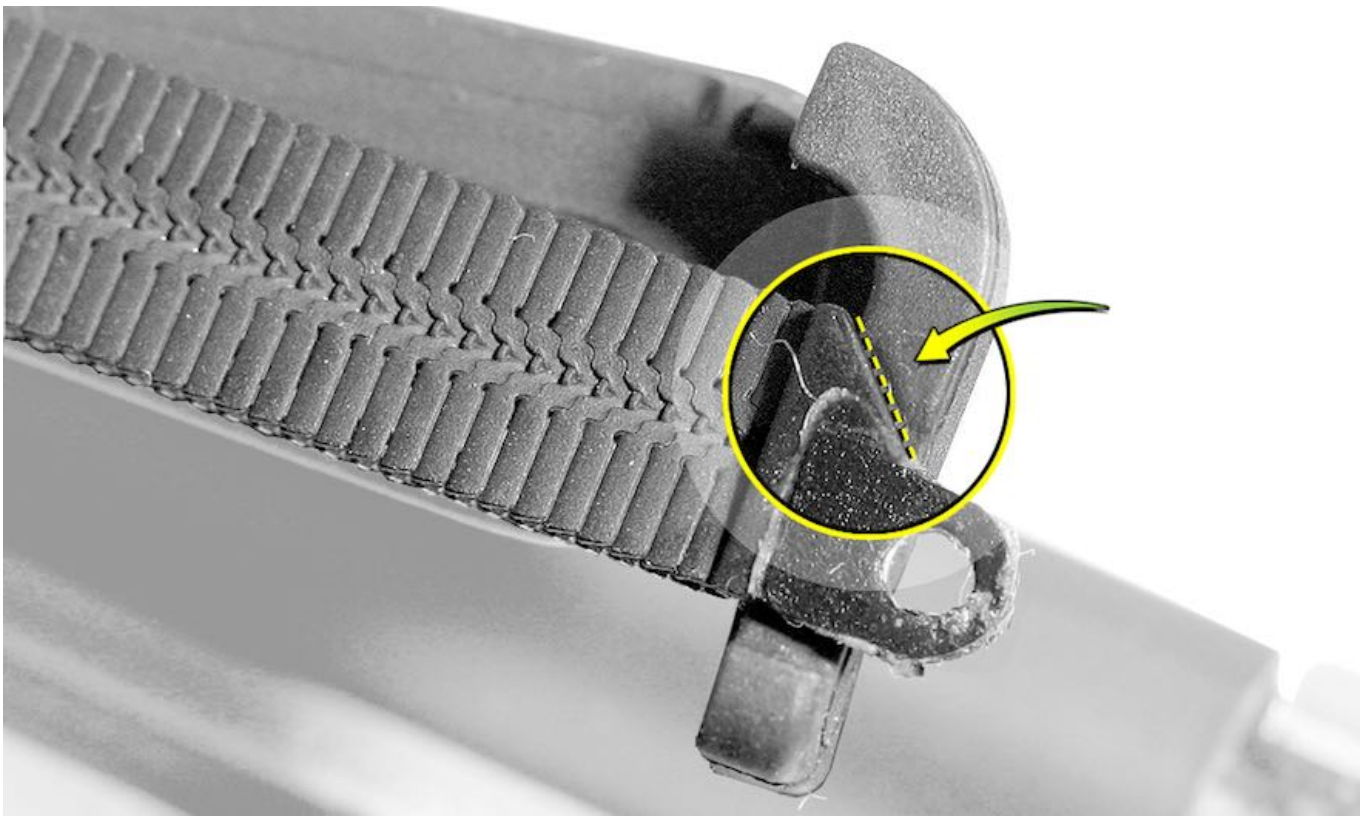
4. Make sure mylar frame is centered over chip **and covers the tiny capacitors**. Do not press too hard or the capacitors may be damaged.



5. Assemble thermal rubber gasket onto heat sink.

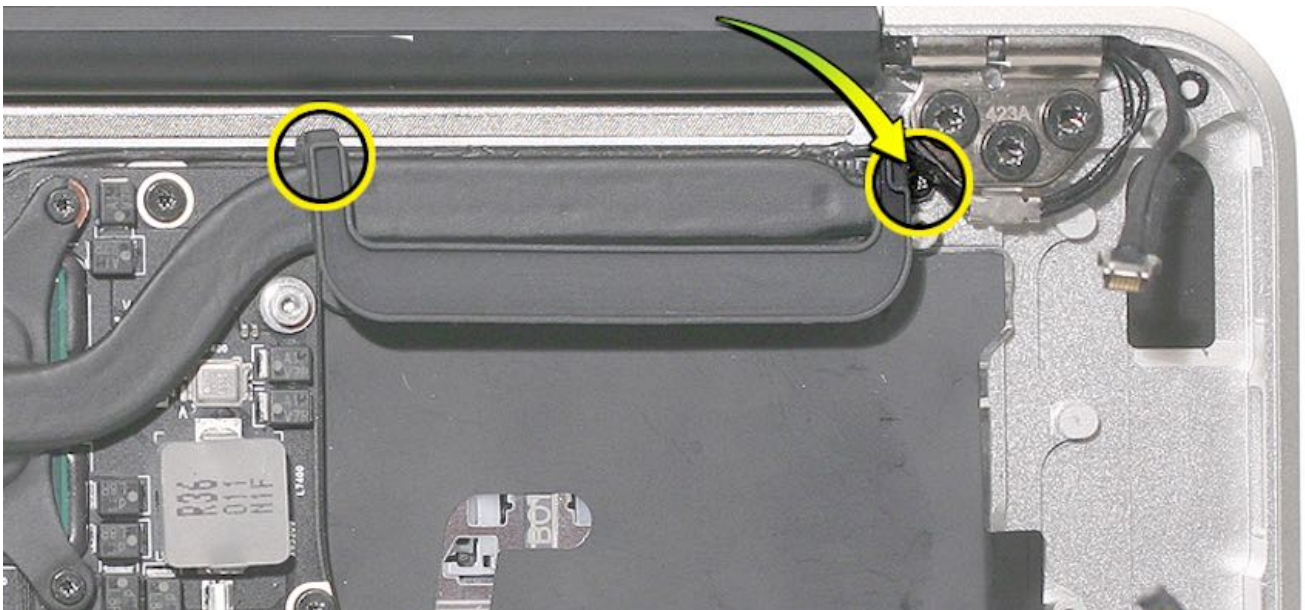


6. Align edge of heat sink with indent on thermal gasket (shown by the dotted line, on the underside of the thermal gasket).



7. Carefully turn heat sink and thermal gasket over.

- Align gasket nub into hole on logic board.
- Align heat sink screw to screw hole in top case.

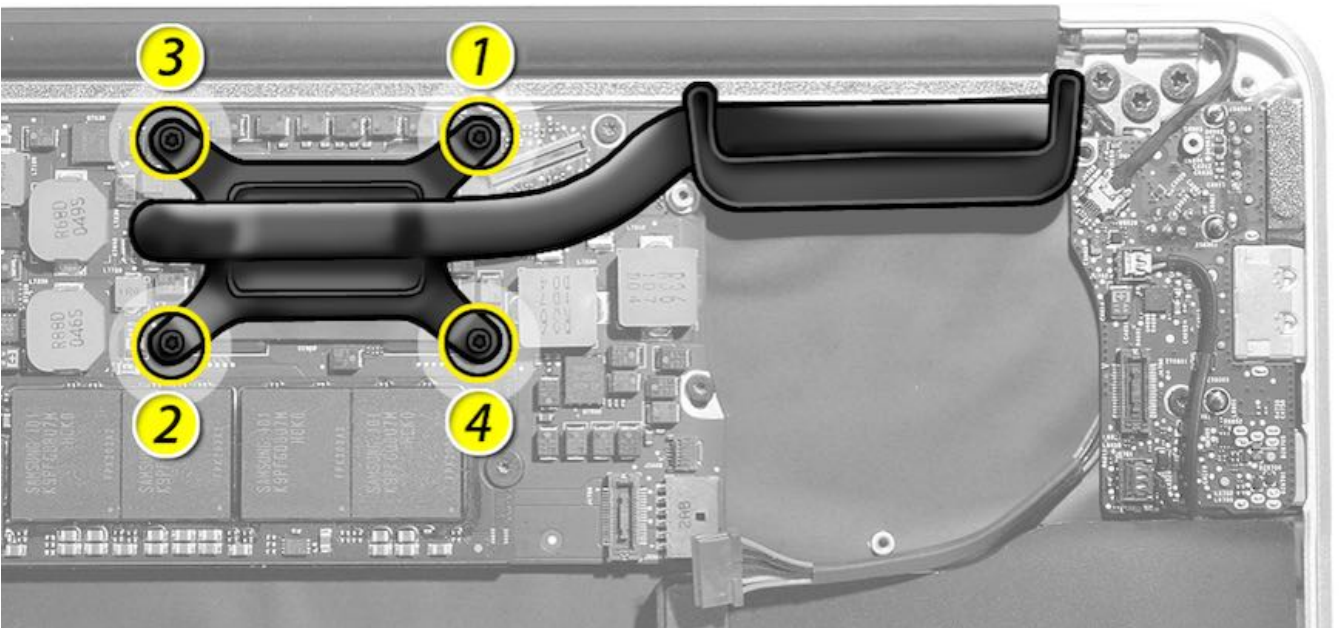


8. Tighten heat sink screw once thermal gasket is seated properly.

Note: Be careful not to clip or damage AirPort/Bluetooth cable when reinstalling screw.



9. Replace remaining screws in order shown. Install screws 1/2 way first; then tighten in order shown.



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012): Logic Board

First Steps

For video instruction, refer to Apple Support article [SV175: Logic Board Replacement Video](#).

Remove:

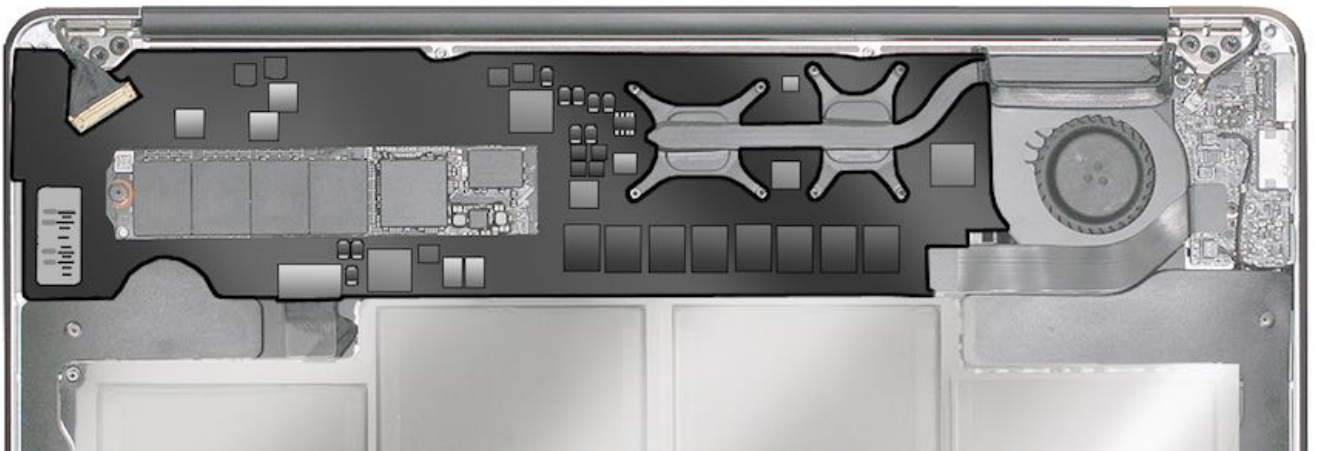
- [Bottom Case](#)
- [Battery](#)
- [SSD Card \(Late 2010\)](#)
- [SSD Card \(Mid 2011/2012\)](#)
- [AirPort/Bluetooth Card](#)
- [I/O Flex Cable](#)
- [Fan](#)



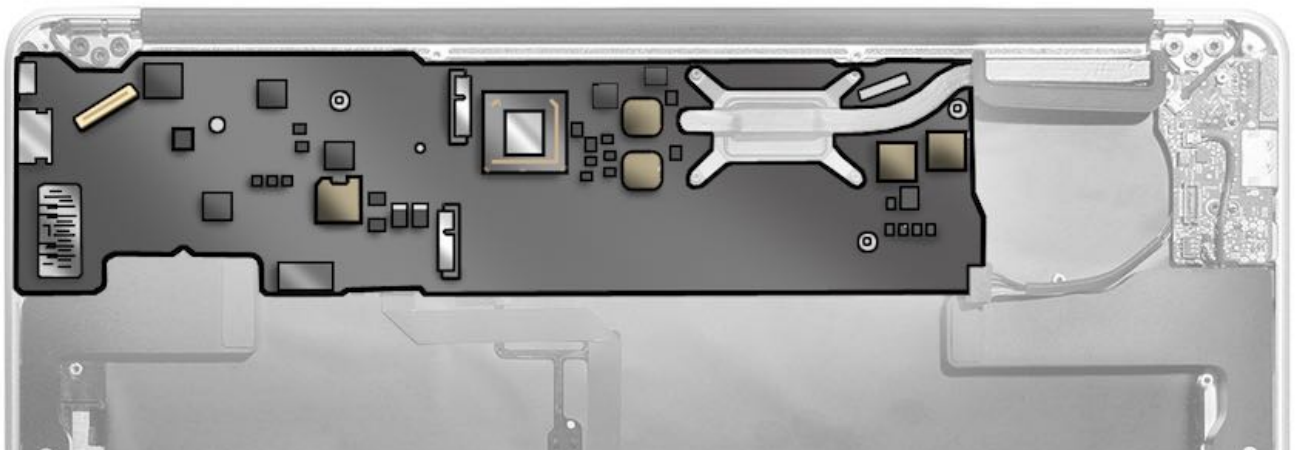
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.

Late 2010

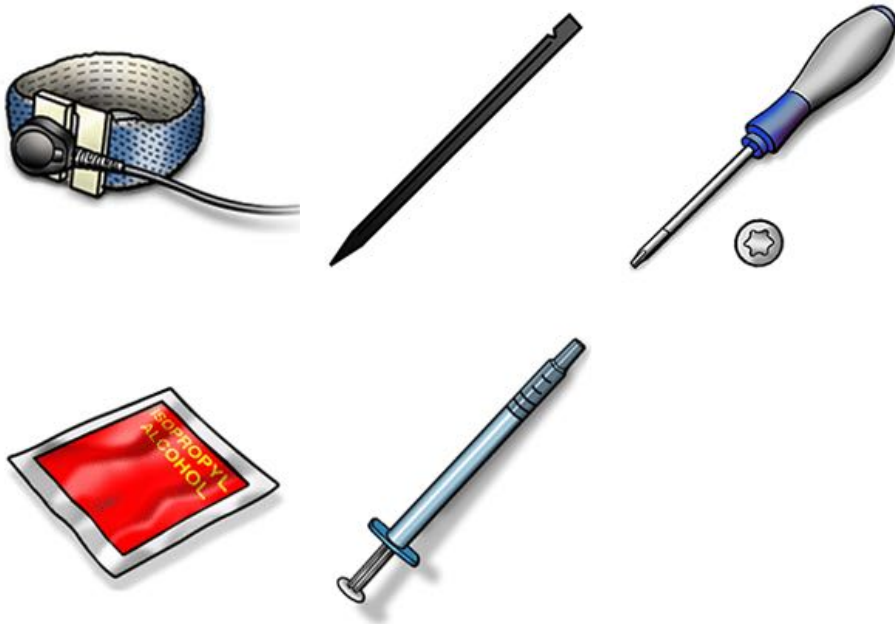


Mid 2011/2012



Tools

- ESD wrist strap
- Black stick
- Torx T5 screwdriver, magnetized
- Alcohol pad
- Thermal grease



Steps For Removal

1. If replacing logic board, transfer heat sink to replacement.

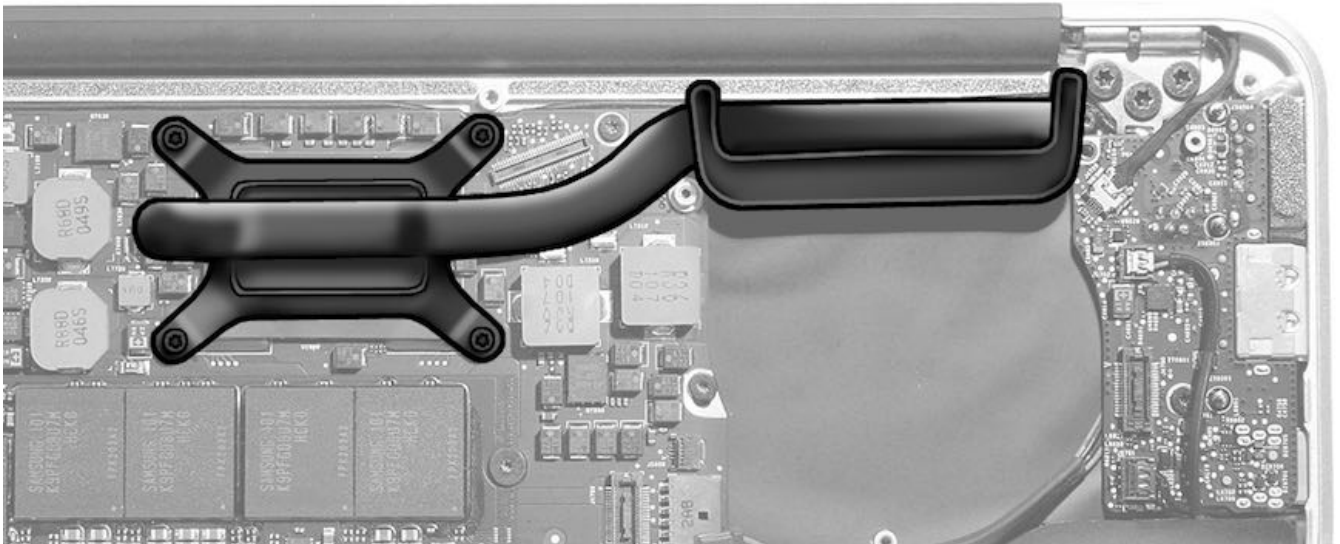


Caution: To avoid flexing original or replacement logic boards:

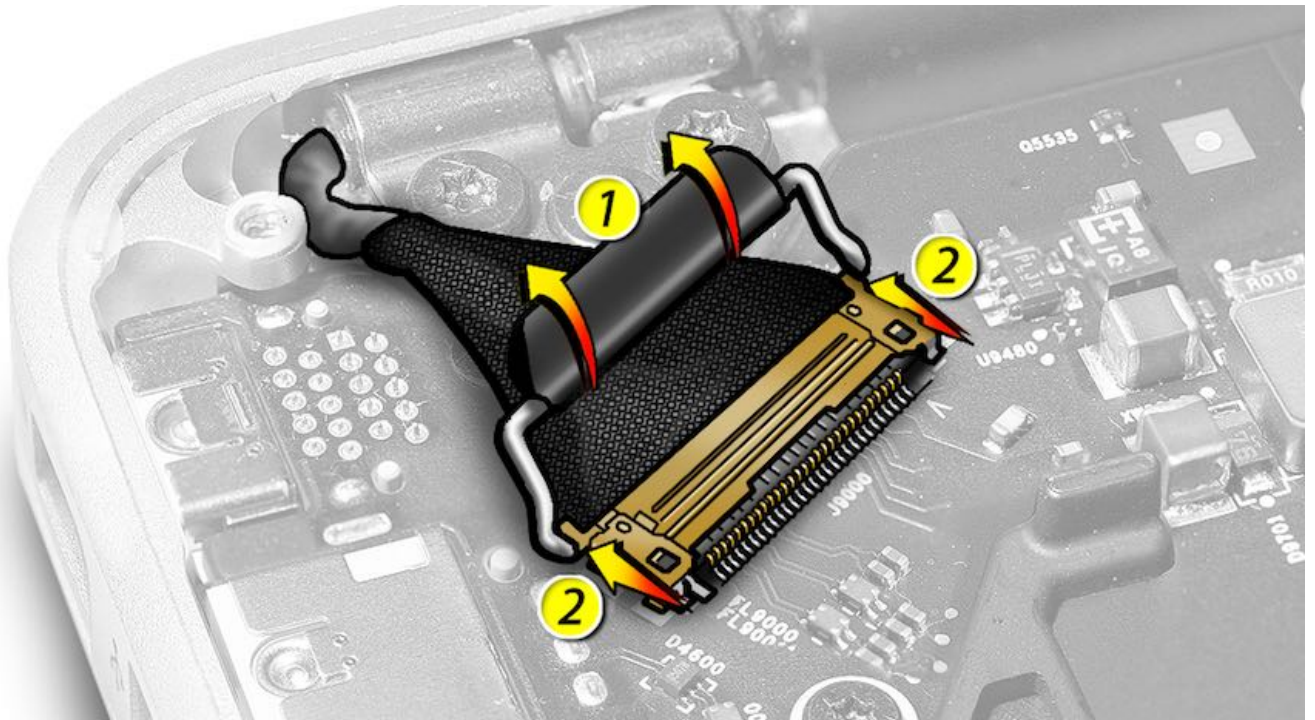
- Remove heat sink from original board while still in top case. See [Heat Sink Thermal Module \(Late 2010\)](#) or [Heat Sink Thermal Module \(Mid 2011/2012\)](#).
- Install heat sink on replacement board after installed in top case.
- If reinstalling same logic board, do not remove heat sink.

Late 2010





2. Flip up locking bar and pull embedded display port (EDP) cable—not bar—to disconnect cable.

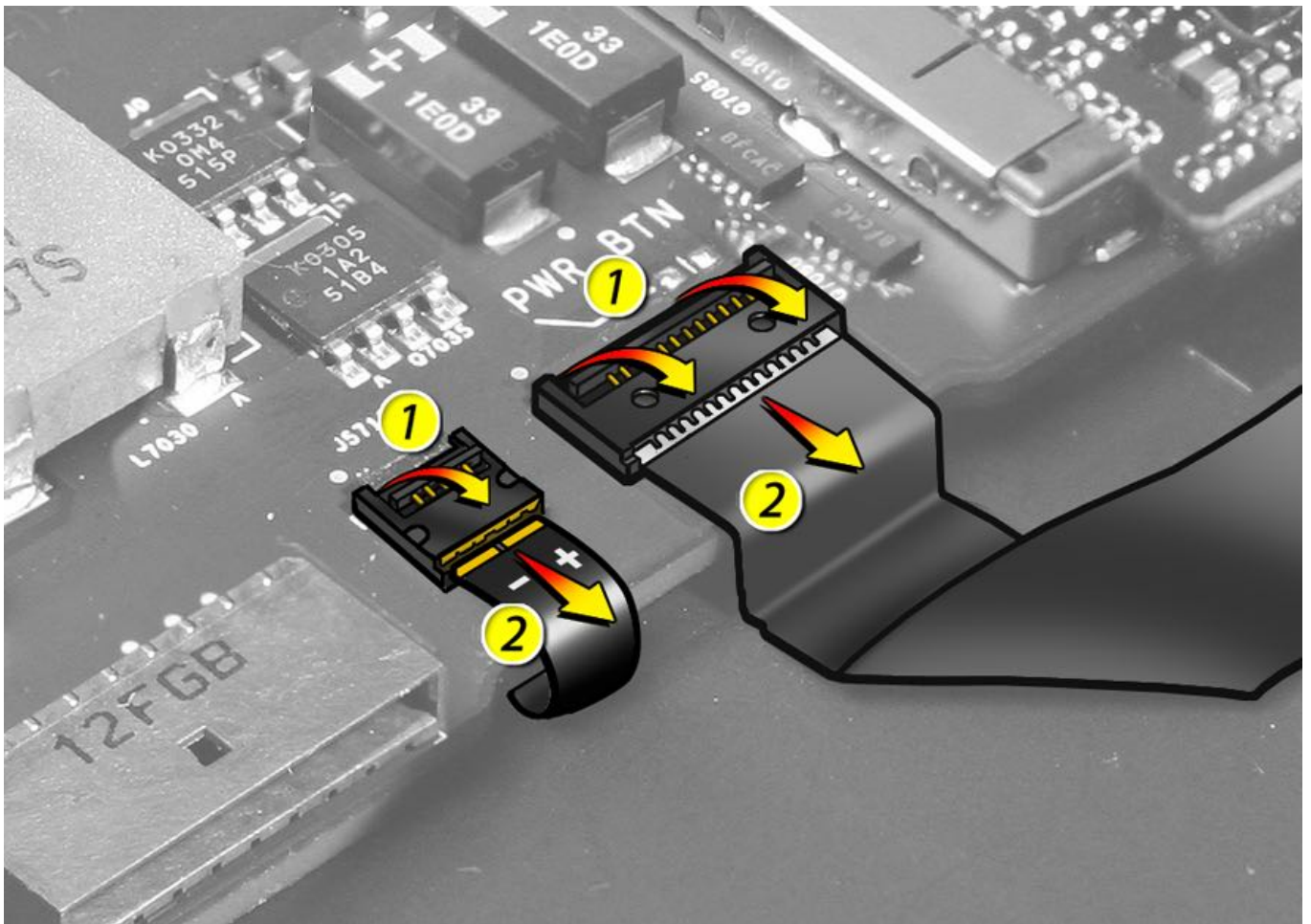


3. On lower edge of logic board, use black stick to flip IPD cable locking lever up, toward keyboard.

Gently remove IPD cable from logic board connector.

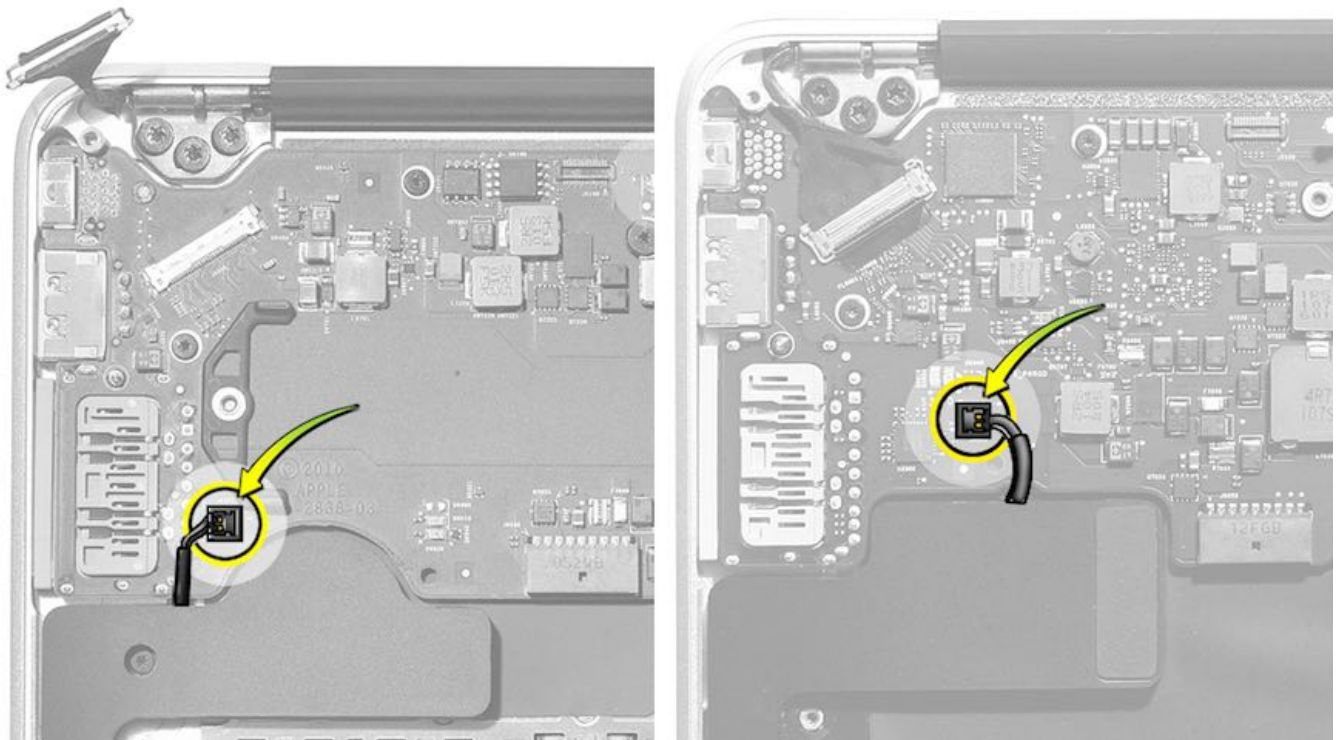
For Mid 2011/2012 models, follow same procedure for backlight cable.

Note: When returning logic board to Apple, leave fan, IPD, and backlight locking levers in down (closed) position.



4. Disconnect right speaker cable from logic board.

Image shows Late 2010 (left) and Mid 2011/2012 (right) models.

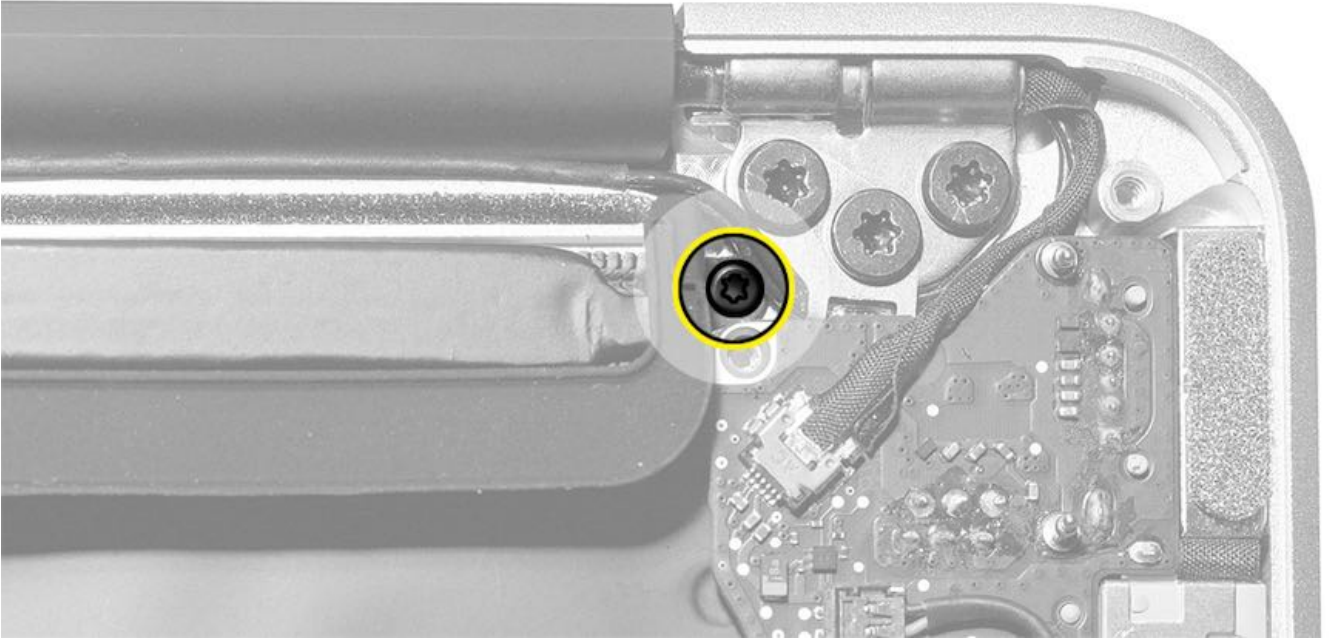


5. If still installed, remove 1 Torx T5 screw in top right corner of heat sink.

(1) 922-9655 (2.4 mm)



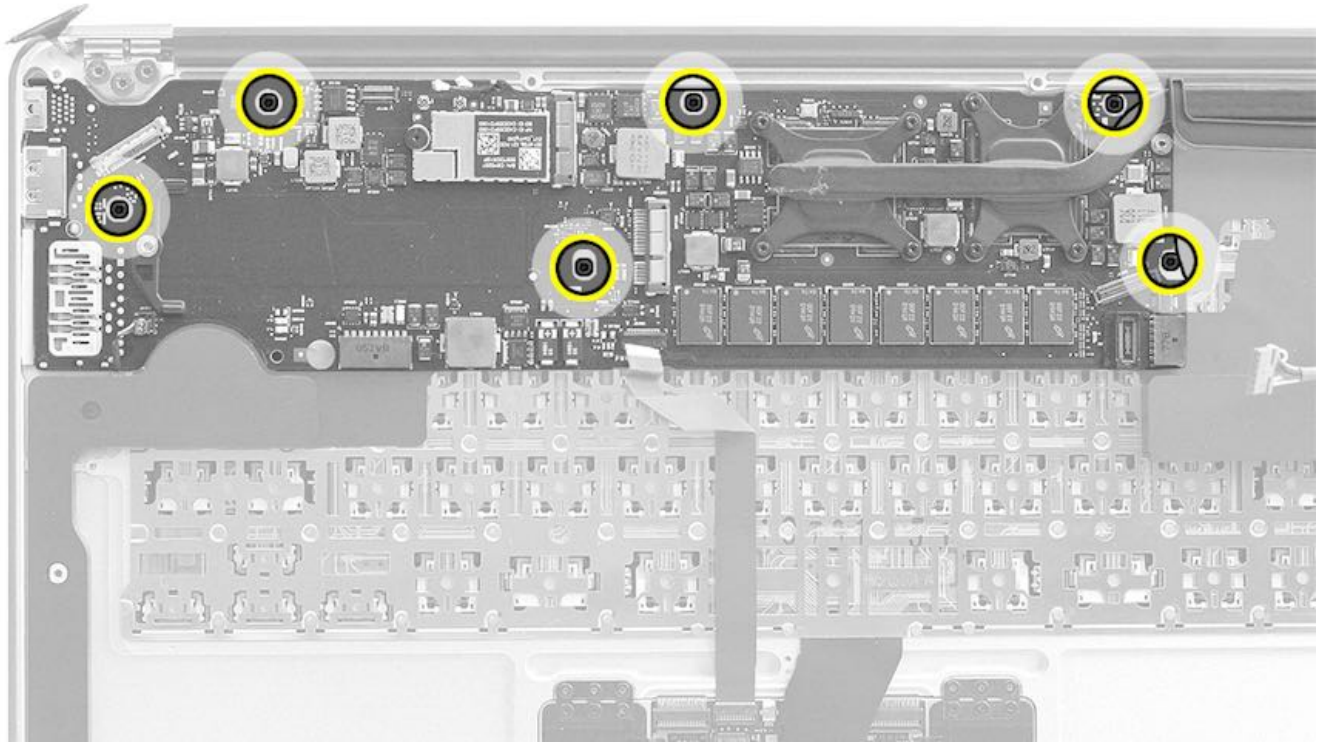
Caution: Do not grasp heat sink by heat sink arm.



6. Remove 6 Torx T5 logic screws.

(6) 922-9656 (6.3 mm)



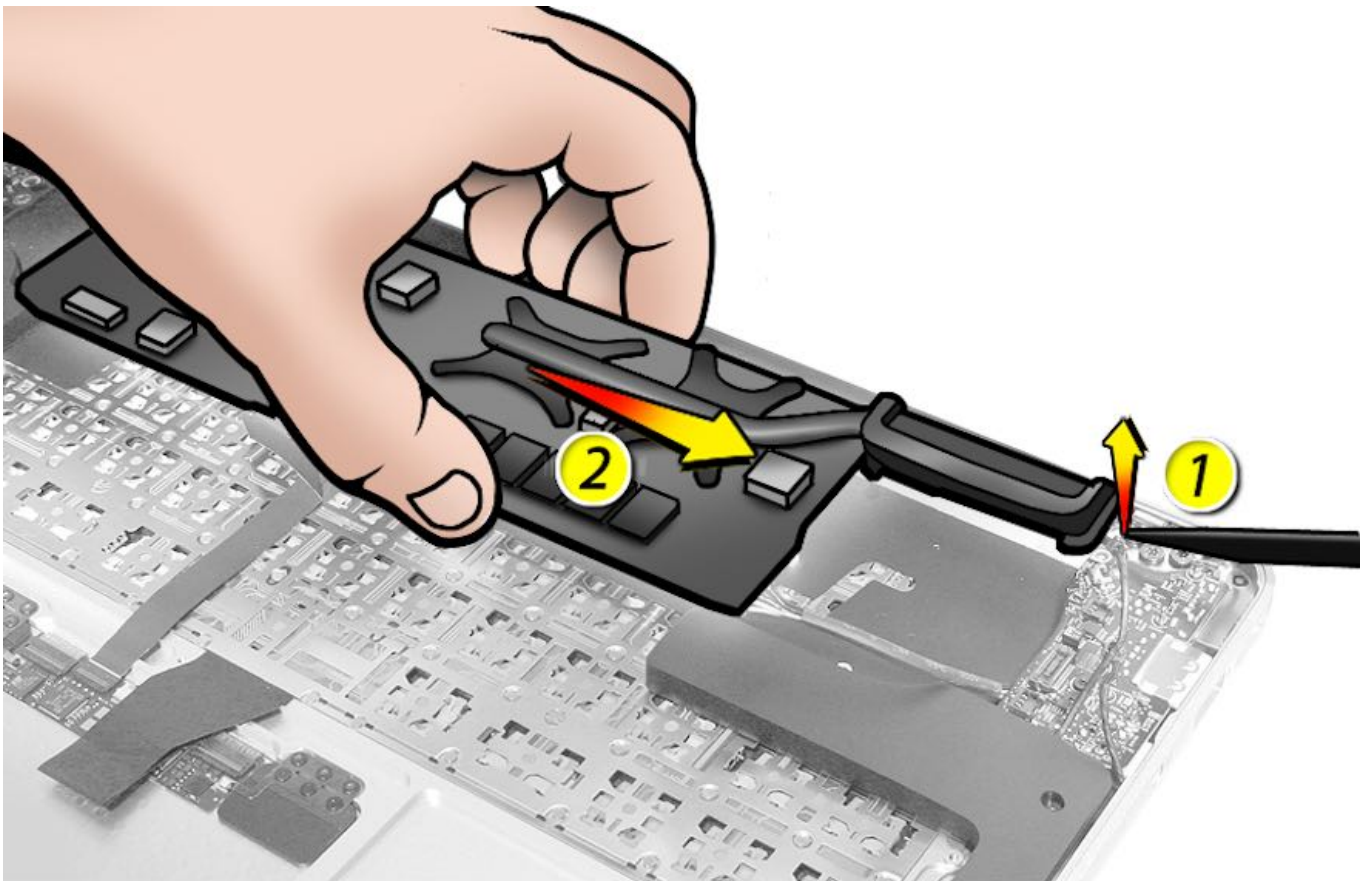


Caution: In the next step, follow safe handling:

- Hold board by edges.
- Do not touch heat sink or connectors.
- Do not touch circuitry.

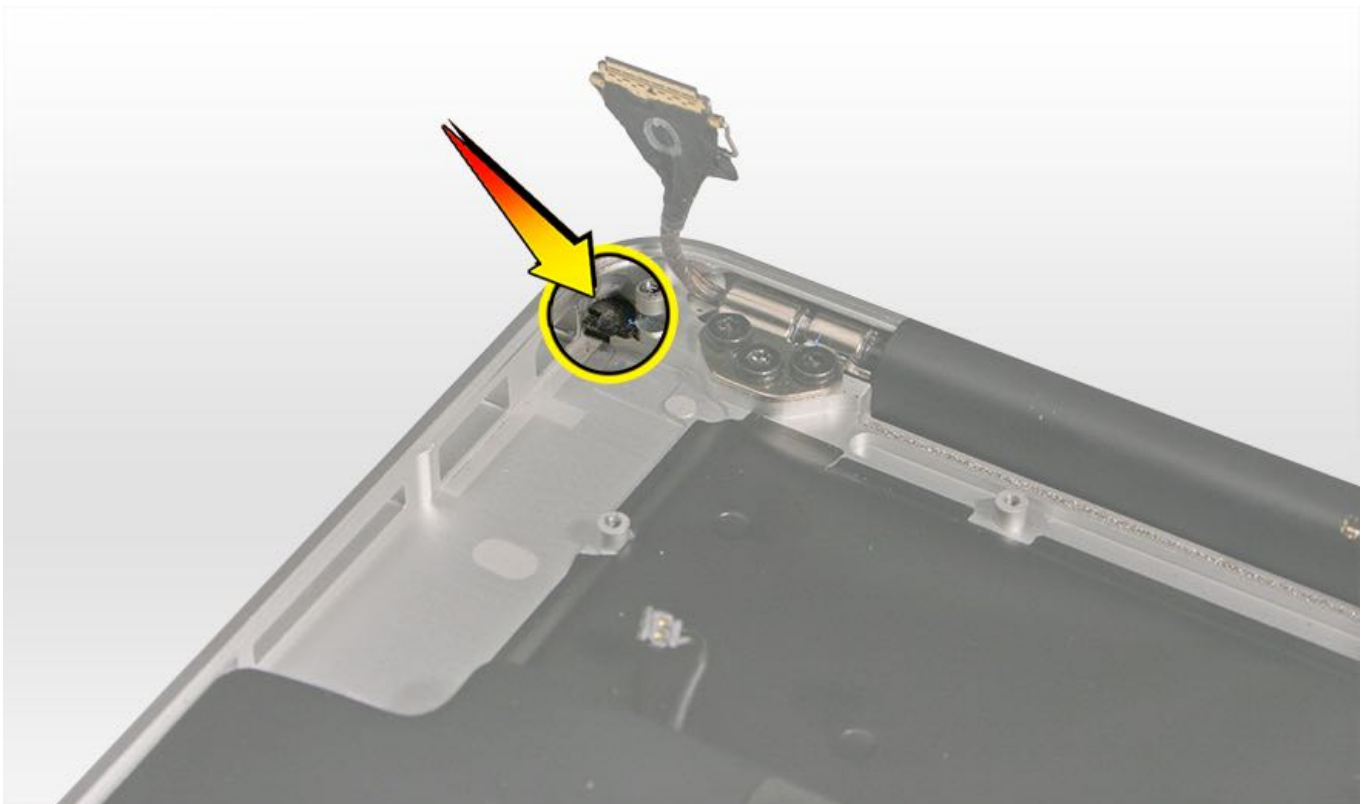
7. If heat sink is in place, carefully free heat sink arm (1) from top case. Then carefully tilt, slightly lift, and remove board (2) from ports on top case.

Note: Tilting the board is important to prevent connector damage.



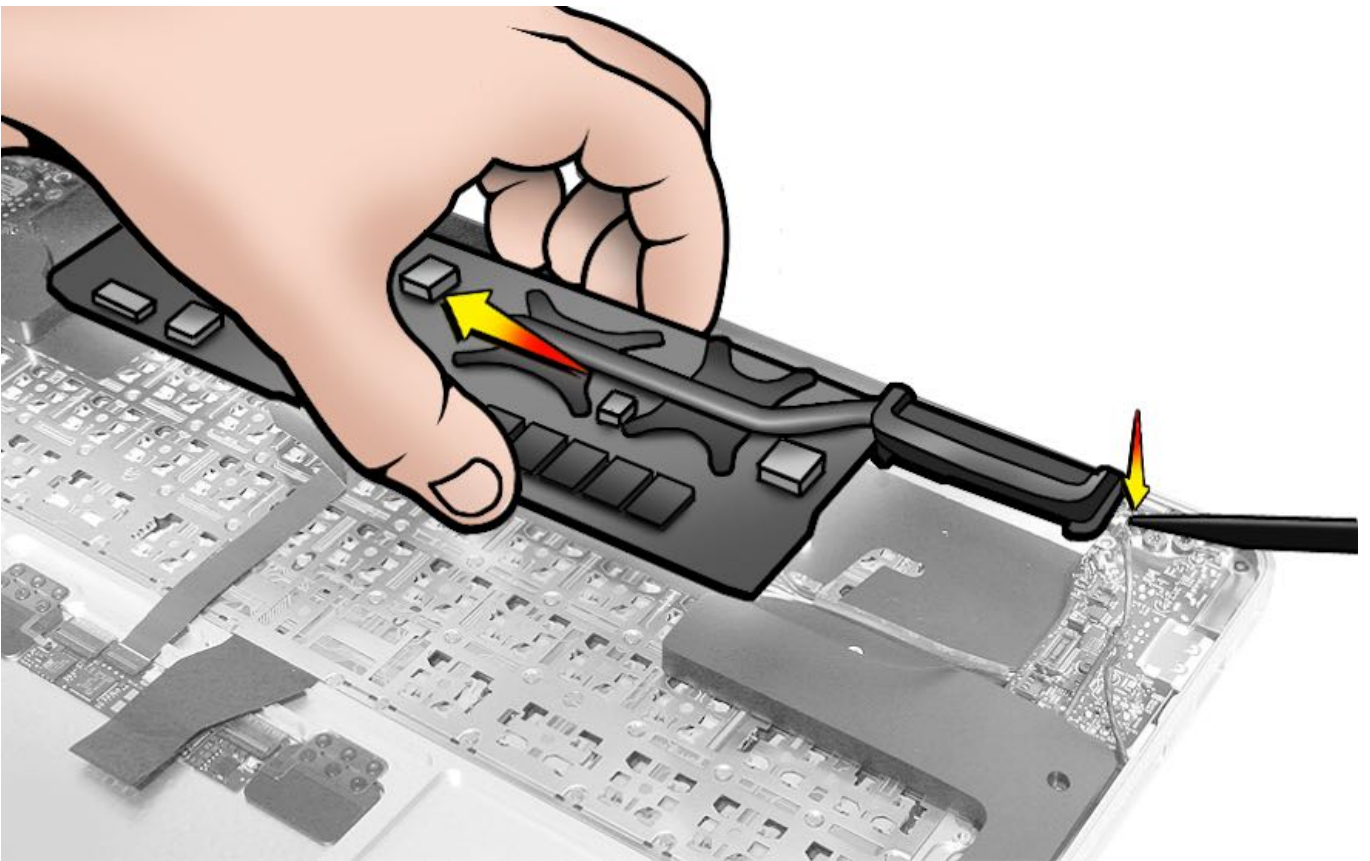
Steps For Reassembly

1. Before installing logic board, check upper right corner of top case and make sure rubber gasket is in position, as shown. Reposition if necessary.

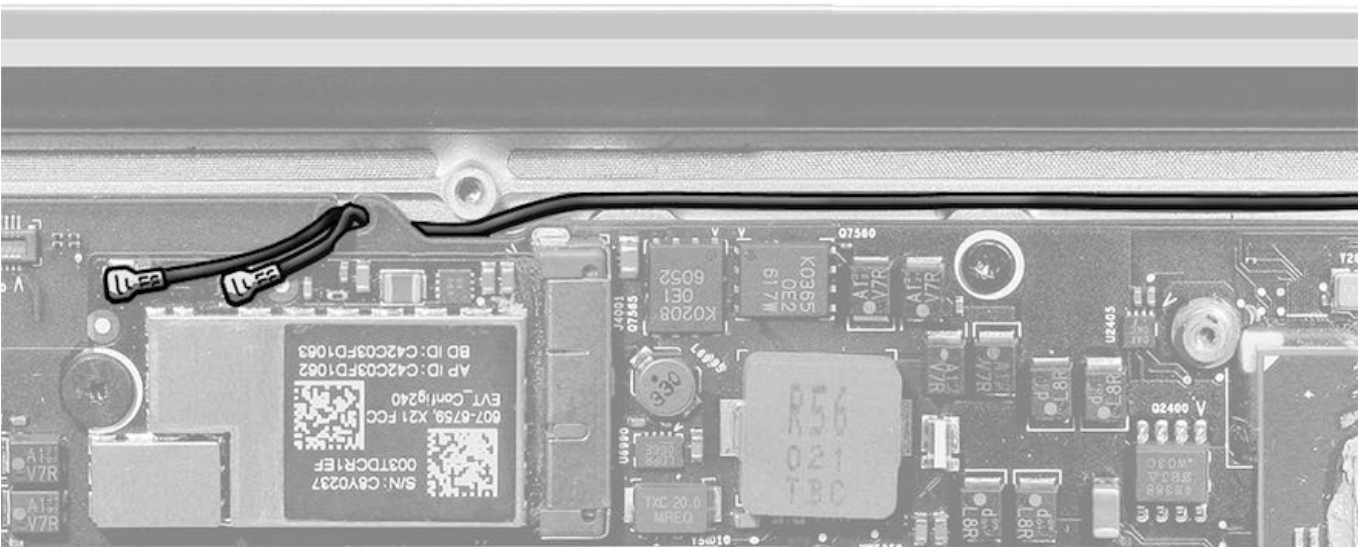


2. Insert Thunderbolt or Mini DisplayPort connector at an angle into opening in top case, using caution to prevent damage to metal EMI ground tabs. Lower board into place. Align connector and screw holes to openings in top case.

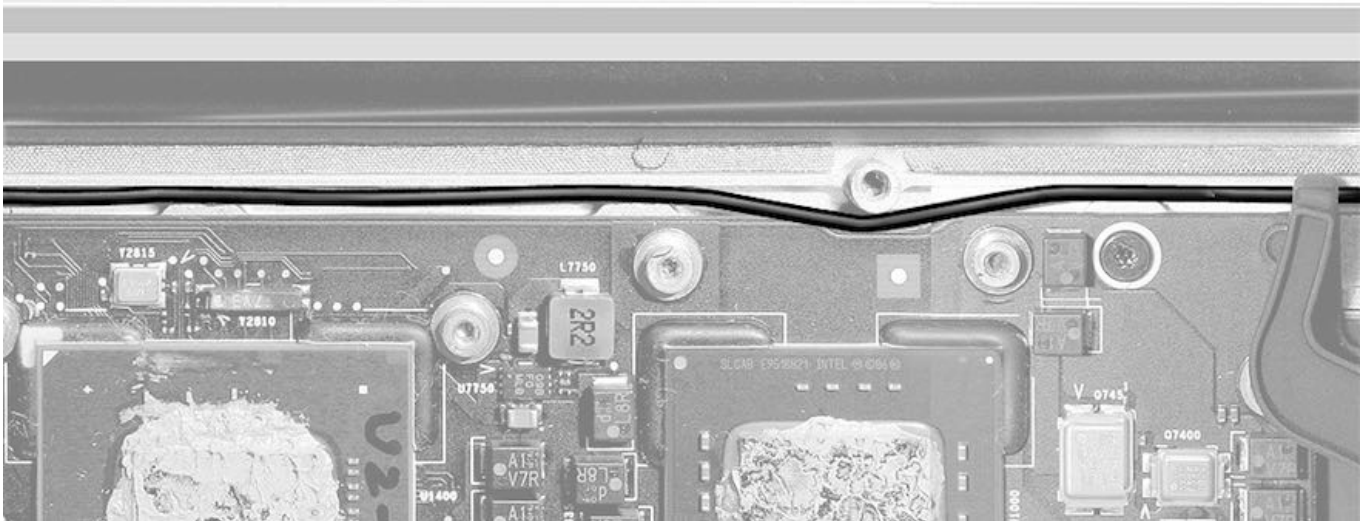
Caution: Ensure cables are not pinched.



3. Reconnect antenna cables to AirPort/Bluetooth card. Route cables into notch on logic board.



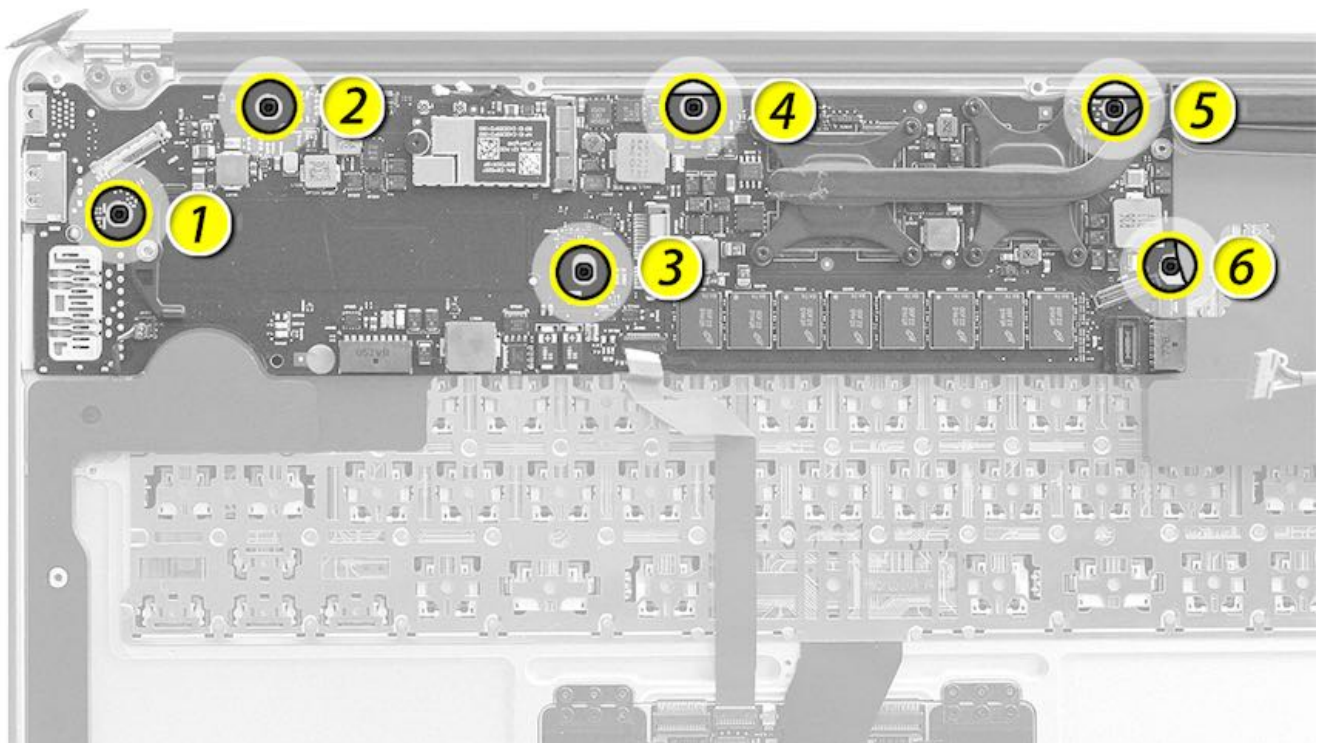
4. Tuck antenna cables into channel along top edge of logic board.



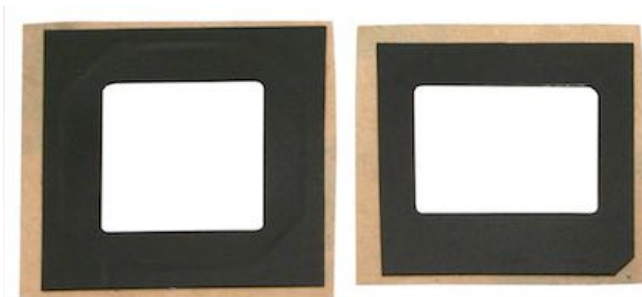
5. Replace 6 logic board screws in order shown.

6. Connect the following:

- EDP Cable
- IPD Cable
- Right Speaker Cable
- Backlight Cable (Mid 2011/2012 models)

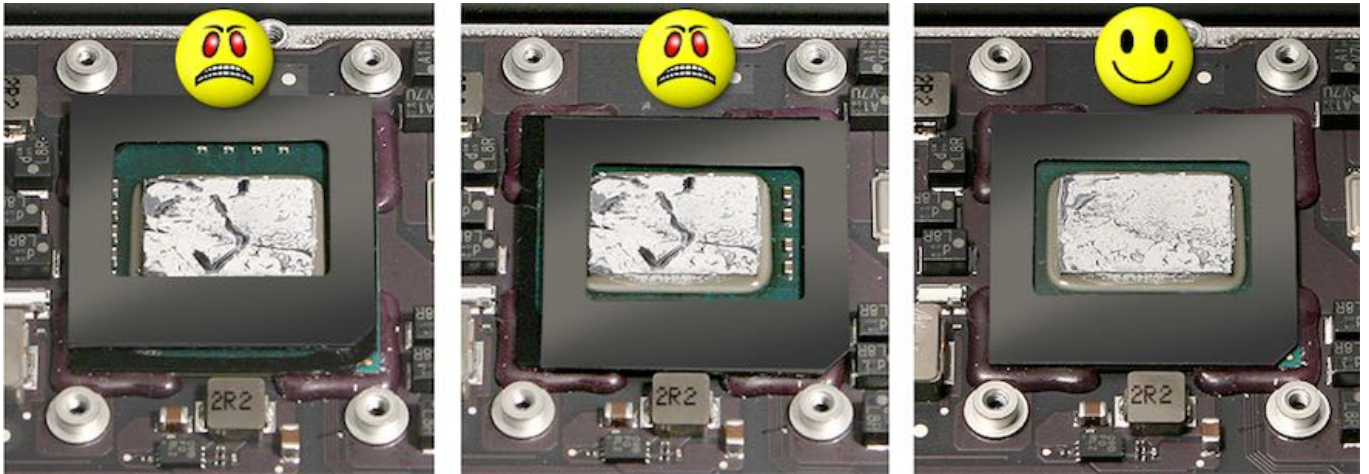


7. If replacing logic board, verify replacement has mylar frame(s) on chip(s).

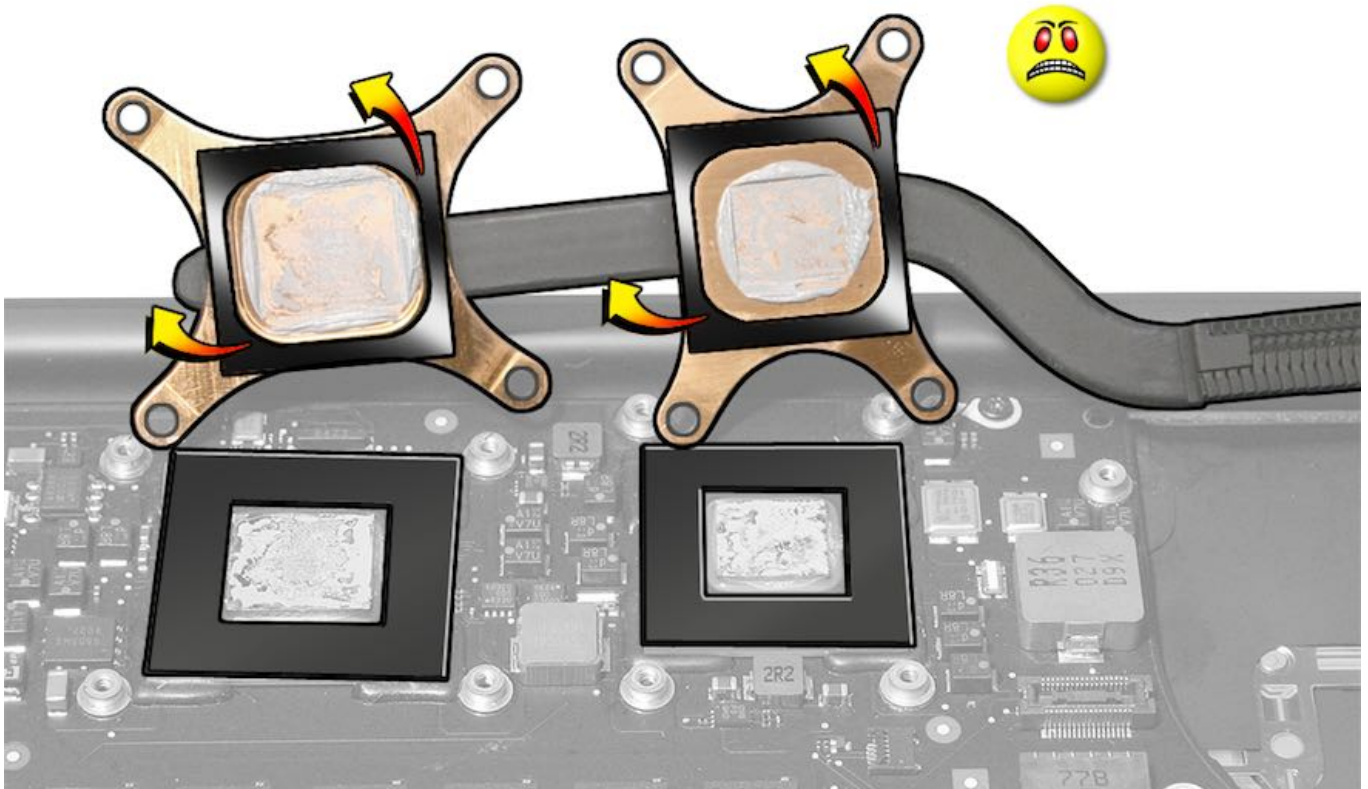




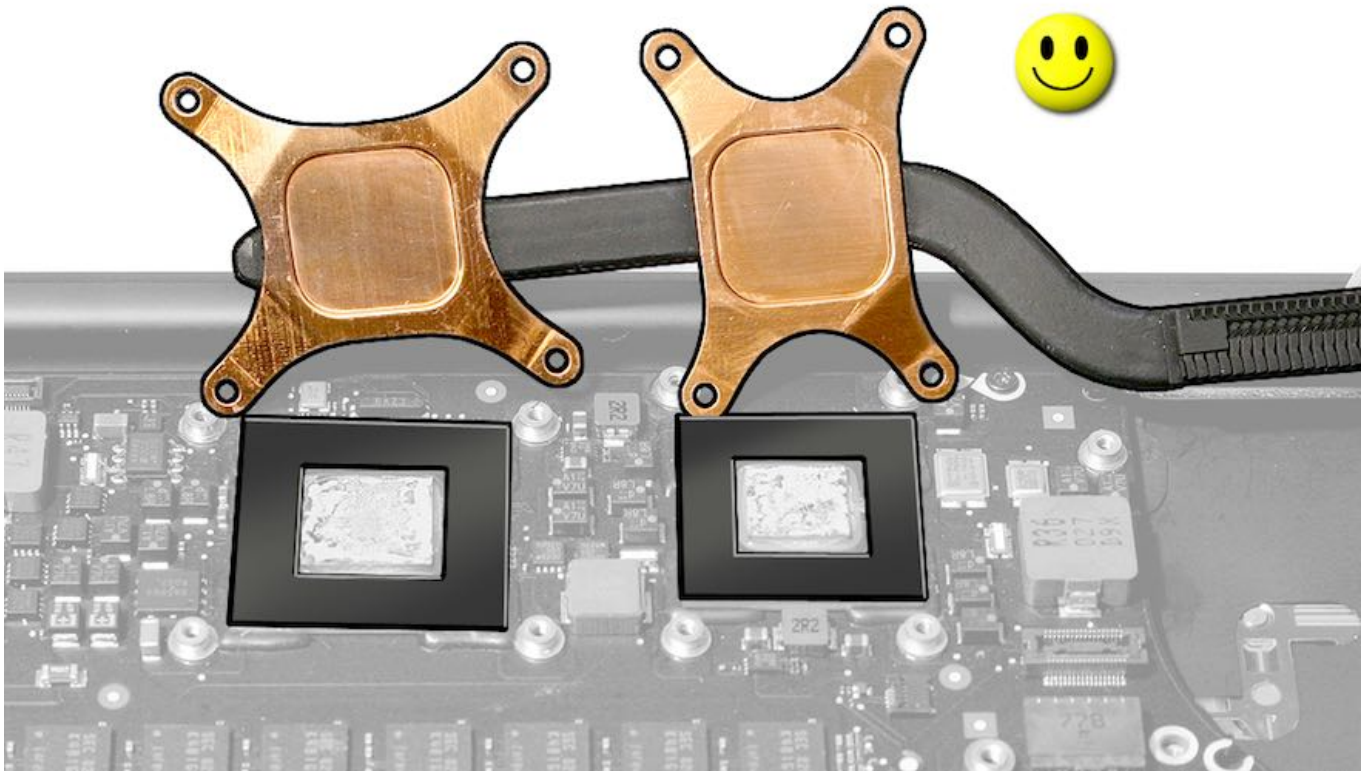
8. **Caution:** If you need to install a frame, center it over chip **and cover tiny capacitors**. Do not press too hard or capacitors might be damaged.



9. If mylar frame(s) are on heat sink, use black stick to remove.



10. Clean heat sink with alcohol wipes. Apply thermal grease to chip(s). Replace heat sink.



11. Reinstall:

- Fan
- I/O Flex Cable
- AirPort/Bluetooth Card
- SSD
- Battery
- Bottom Case

12. Use [Blank Board Serializer](#) to set computer's serial number on new logic board.

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Trackpad

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

IMPORTANT: After replacing a Mid 2013 or Early 2014 trackpad, you must use Trackpad Keyboard Mapper to ensure trackpad is coded to match keyboard version. For more information, refer to Apple Support article [TP1016: AST Reference Guide: Using the Trackpad Keyboard Mapper](#).

Remove:

- [Bottom Case](#)
- [Battery](#)

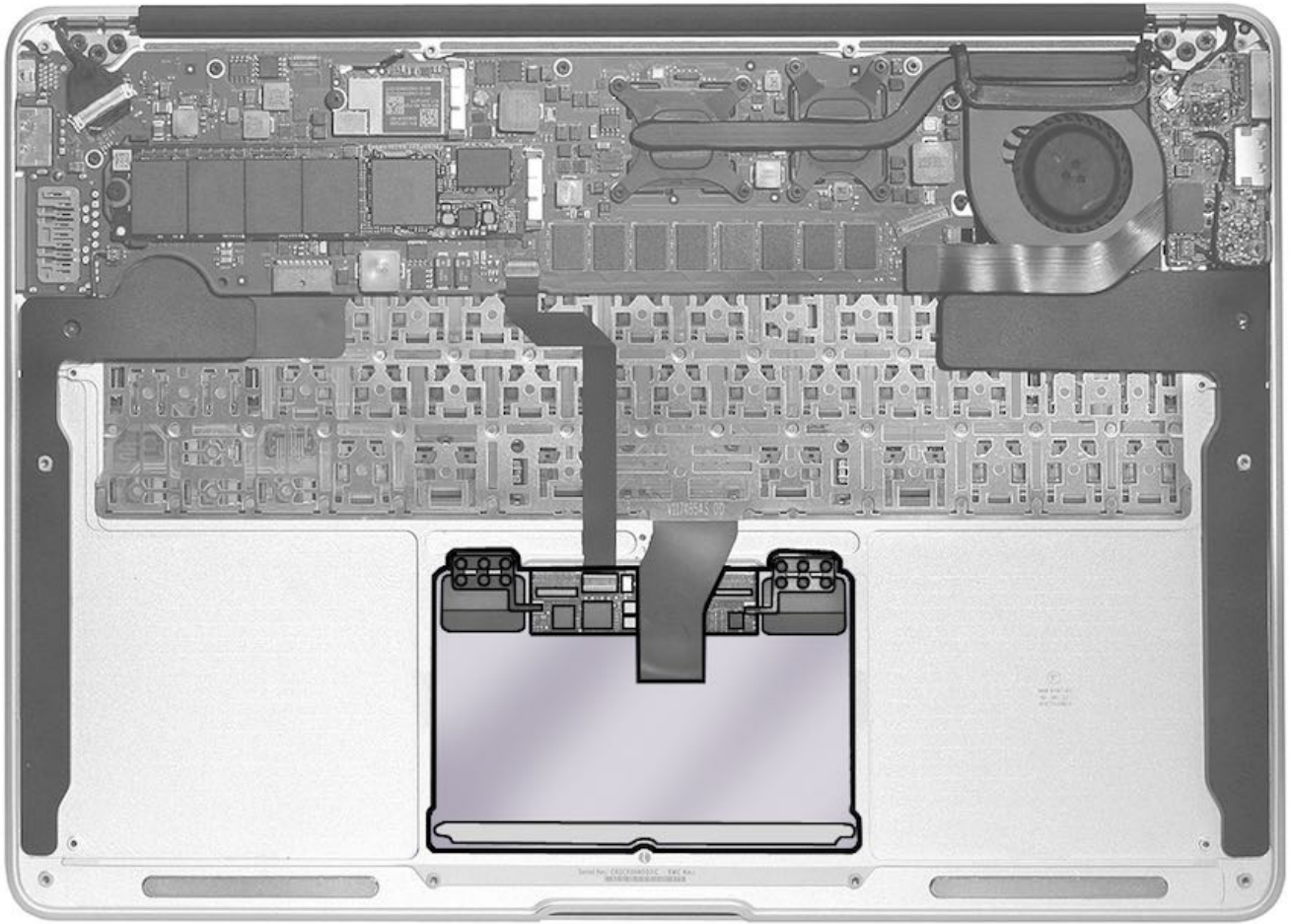


Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before beginning this procedure.

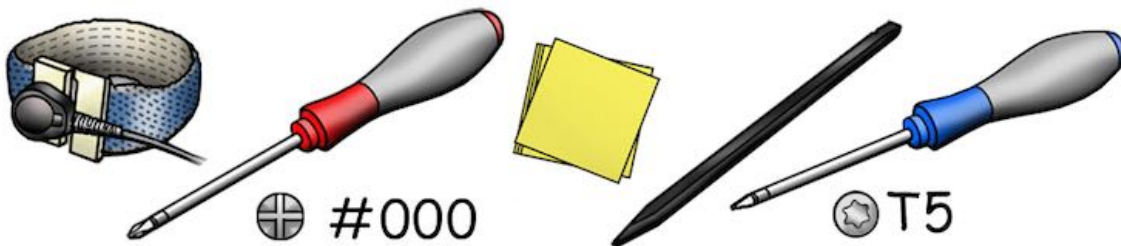
Note: Trackpad kit 923-0124 includes:

- trackpad
- 2 metal flexures
- flexure screws
- set screw



Tools

- ESD wrist strap
- Phillips #000 screwdriver, magnetized
- Sticky (Post-it) notes
- Black stick
- Torx T5 screwdriver

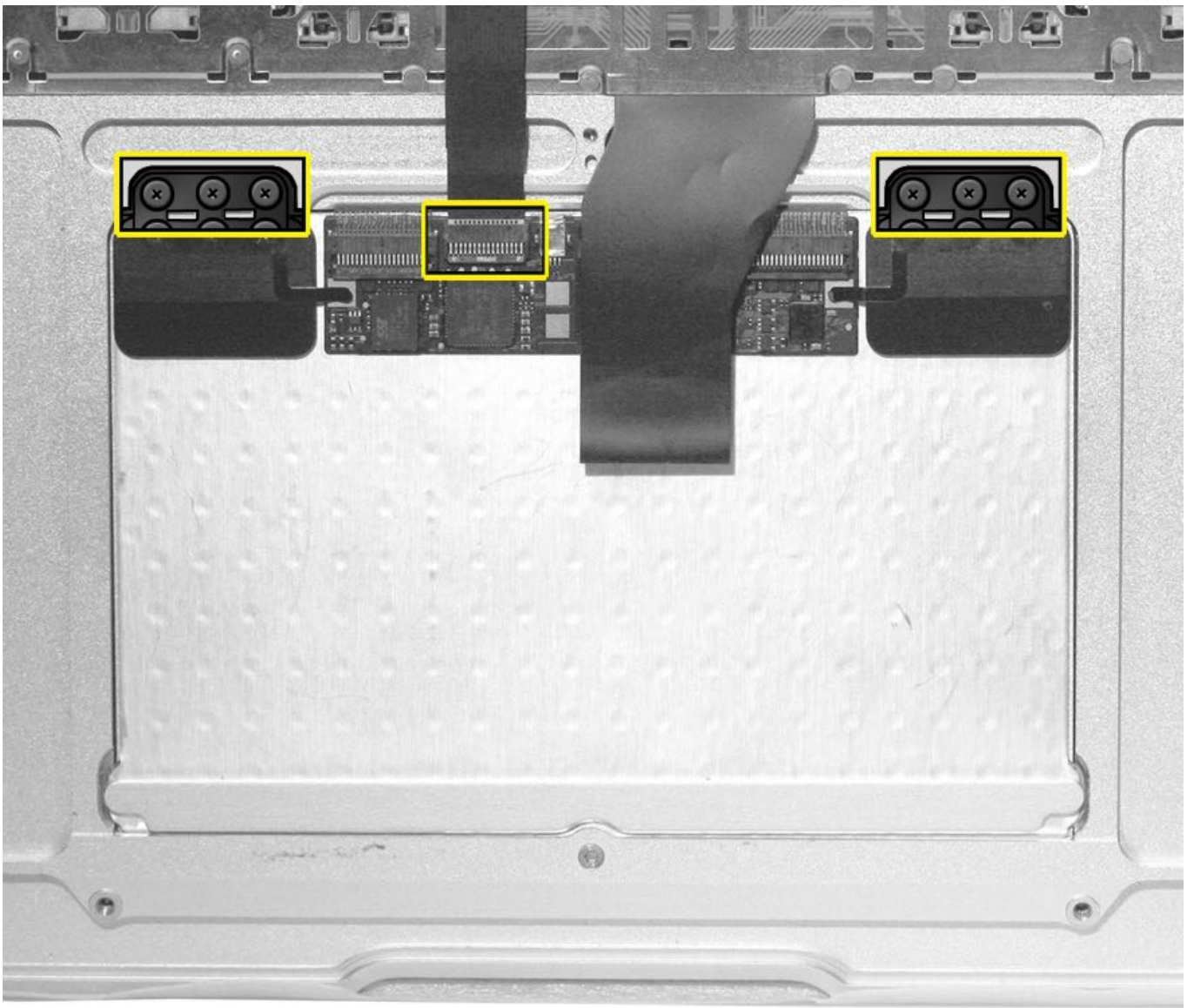


Steps For Removal

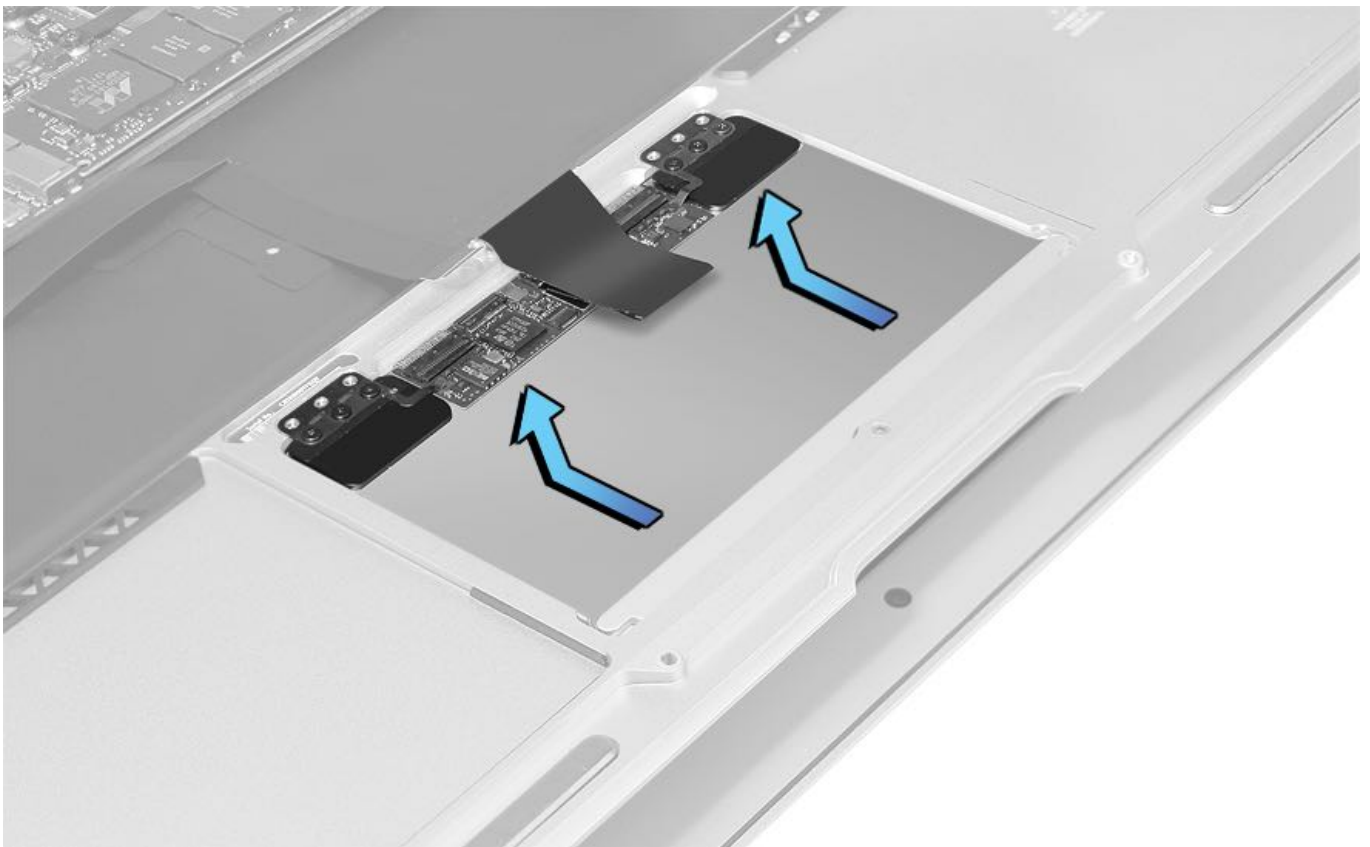
1. Place protective cloth over display.
2. Flip up locking lever to disconnect IPD cable from trackpad. Pull cable toward keyboard.
3. Remove 6 Phillips #000 screws, 922-9658 (1.47 mm), from flexures (3 screws on top row of flexures).

Note: If installing a new trackpad, discard old screws, as they lose their ability to hold securely when reused. Use new screws included with trackpad kit.





4. With keyboard flex cable still connected, lift top case and push trackpad toward keyboard until bottom lip of trackpad clears top case.

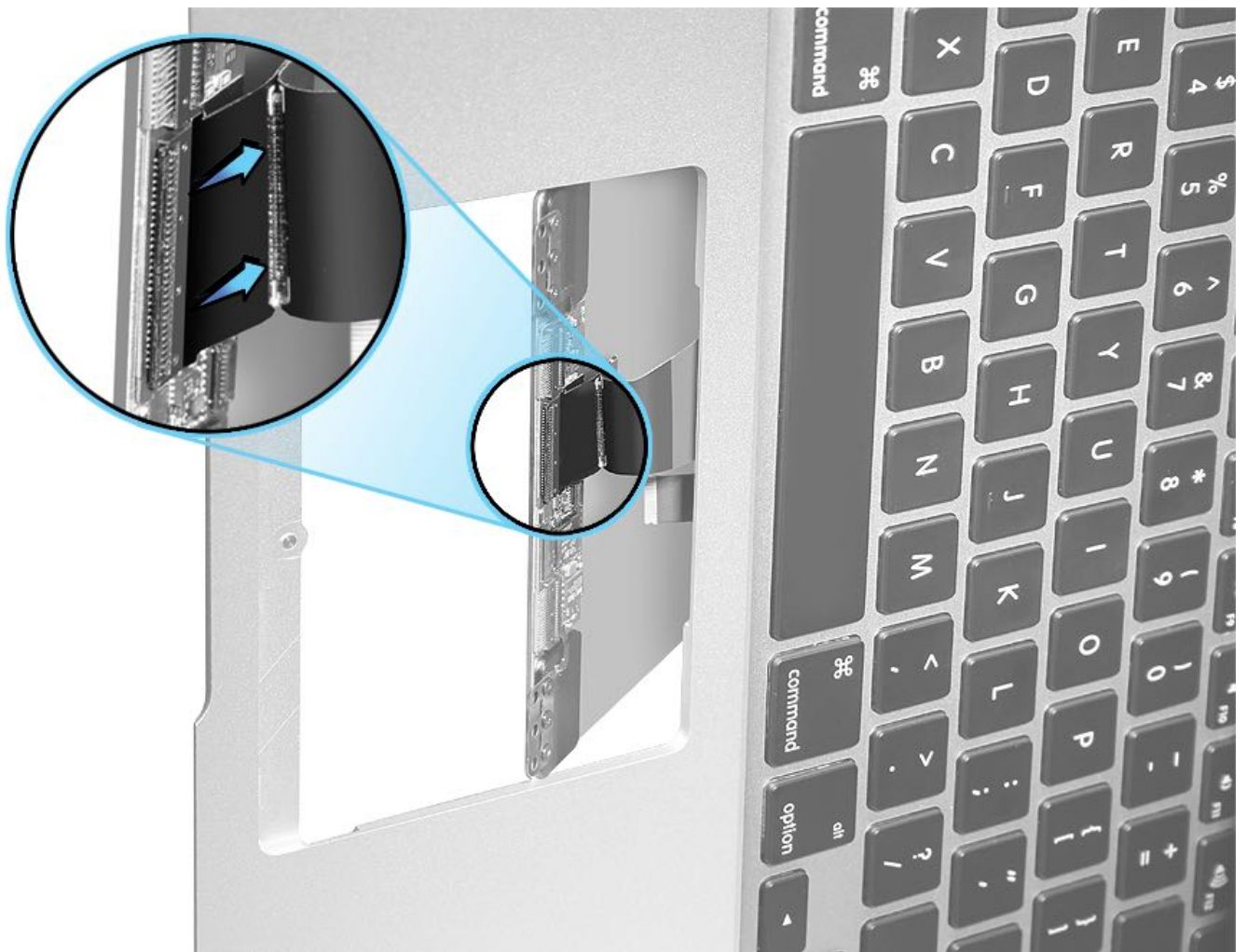


5. Supporting trackpad, open computer display to 90 degrees and place computer vertically.

6. Without straining flex cable, carefully turn trackpad over.

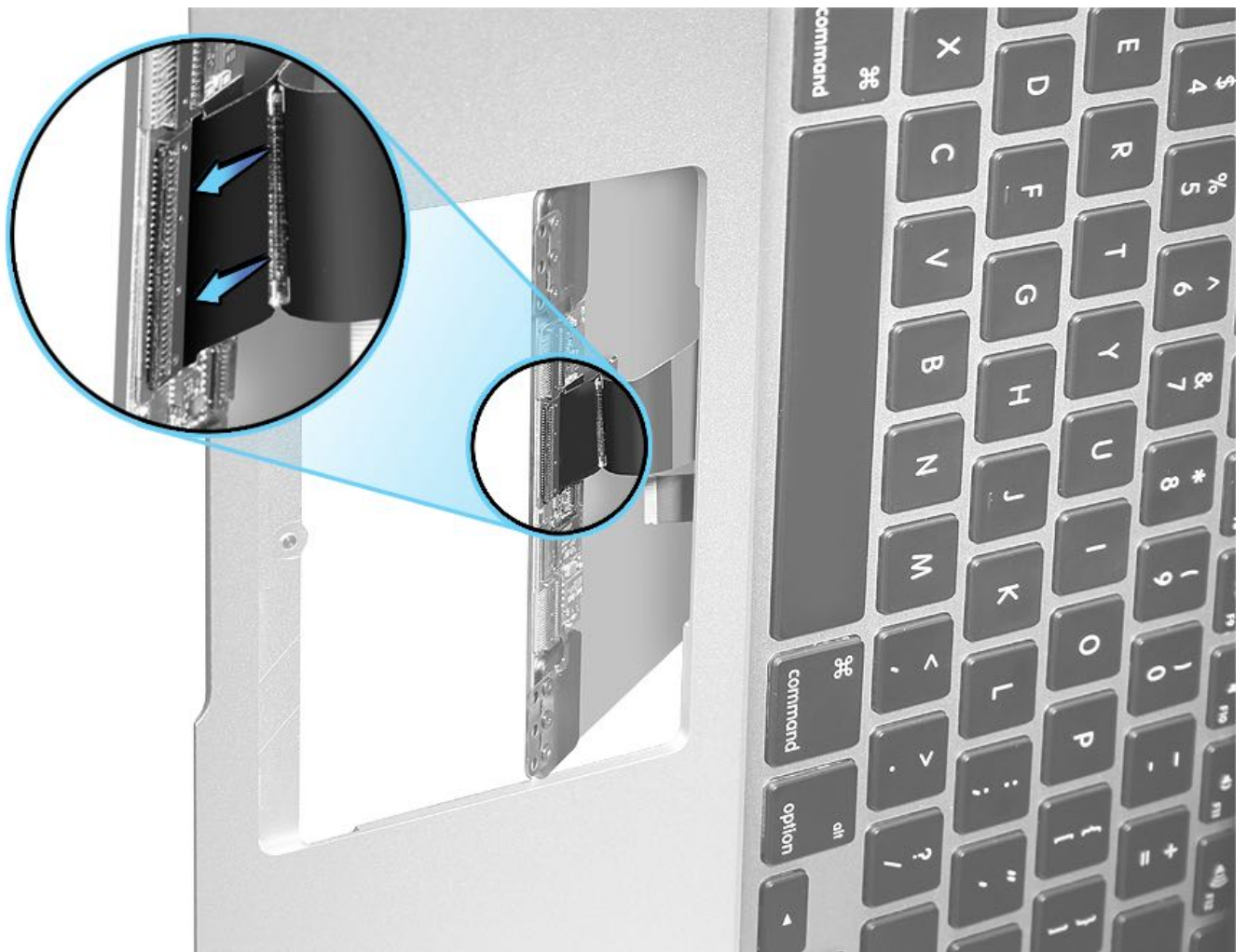


7. Flip up locking lever, disconnect keyboard flex cable from trackpad, and remove trackpad from top case.



Steps For Reassembly

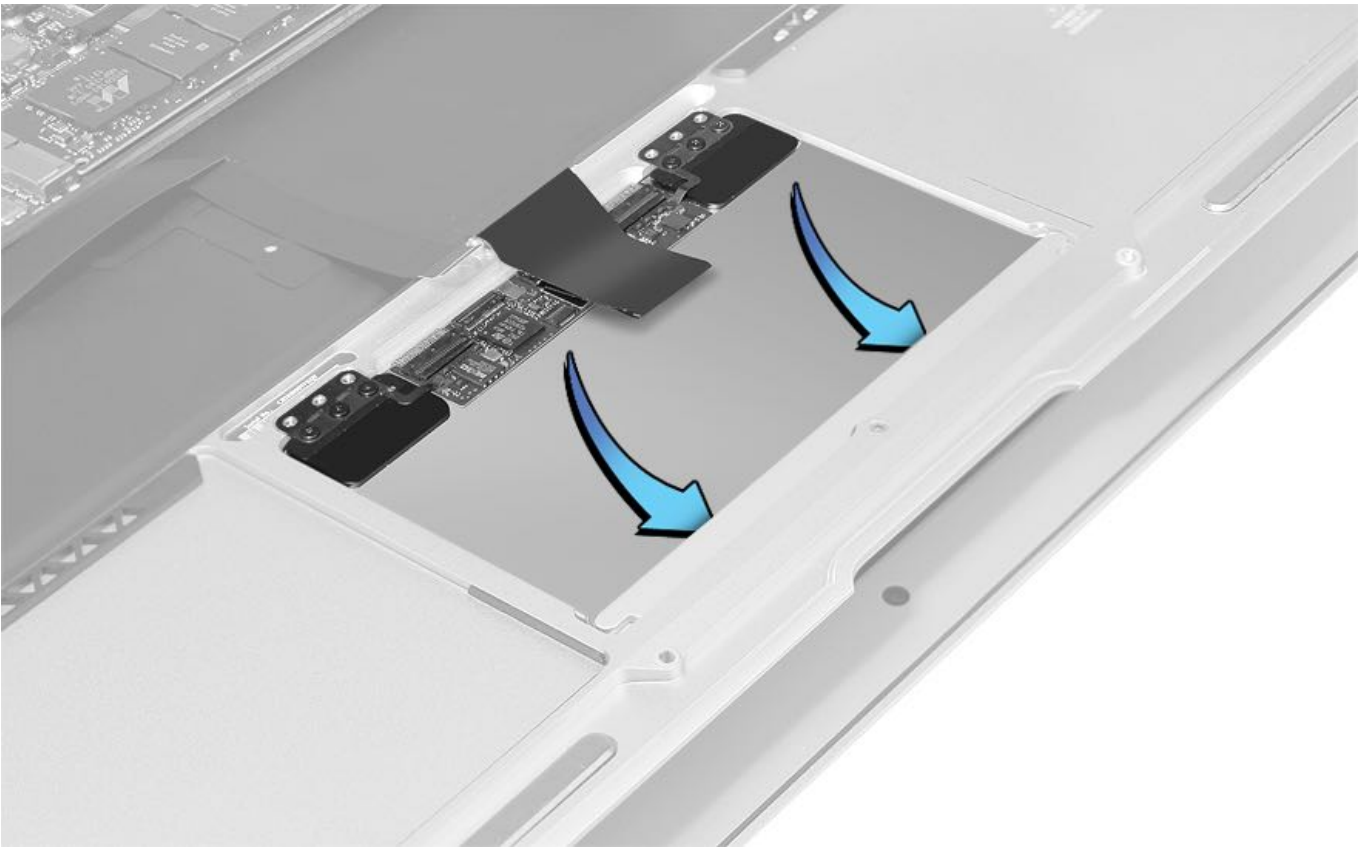
1. With display open and computer placed vertically, connect keyboard flex cable to trackpad. Verify cable is seated properly before locking lever.



2. Rotate trackpad (bottom lip first) into top case.

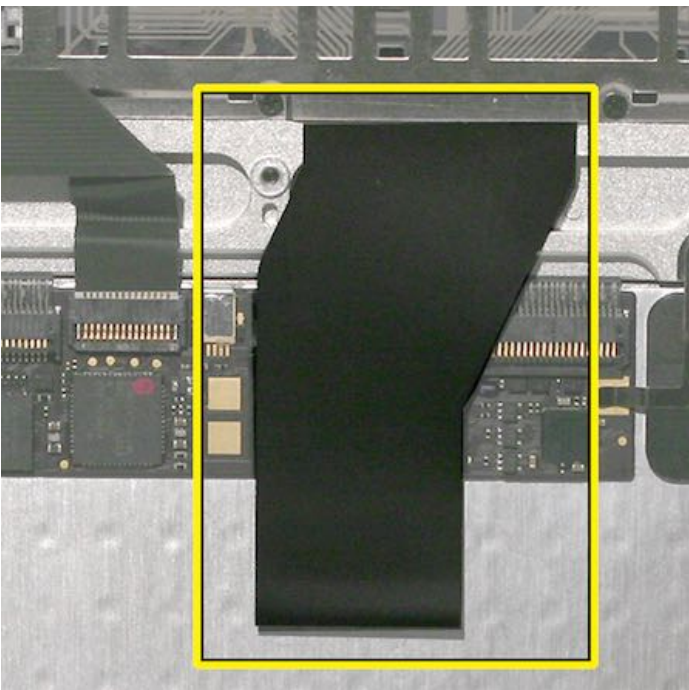
Caution: Be extremely careful not to scratch trackpad against top case during installation, especially along lower front edge, where there is a protrusion on top case for set screw. Scratches on silver trackpad will create black spots when viewed from user side of trackpad.

Caution: Minimize rubbing edges of trackpad against top case while installing. This could cause tiny cracks to form on trackpad.

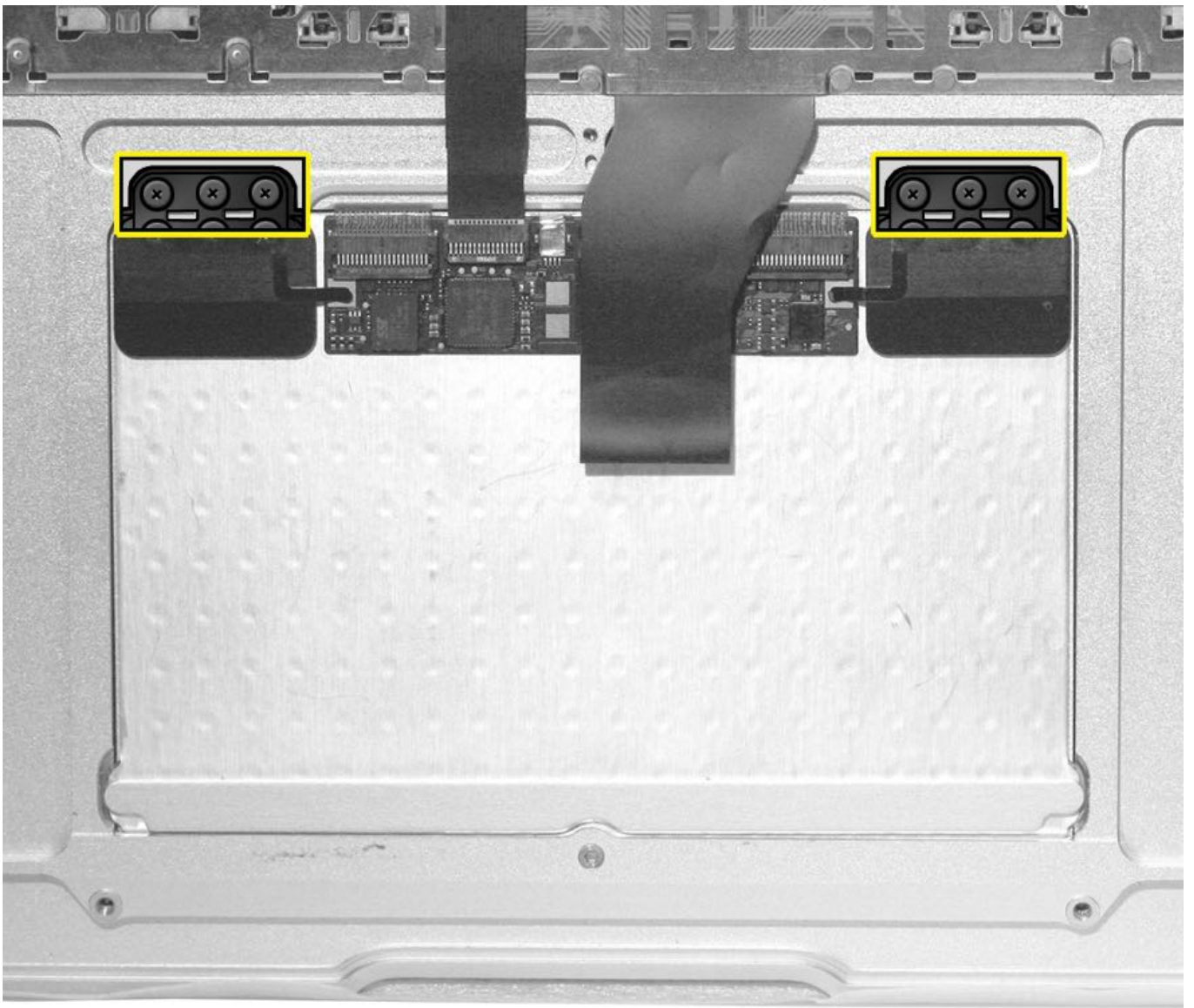


3. Check that keyboard flex cable lies flat against trackpad.

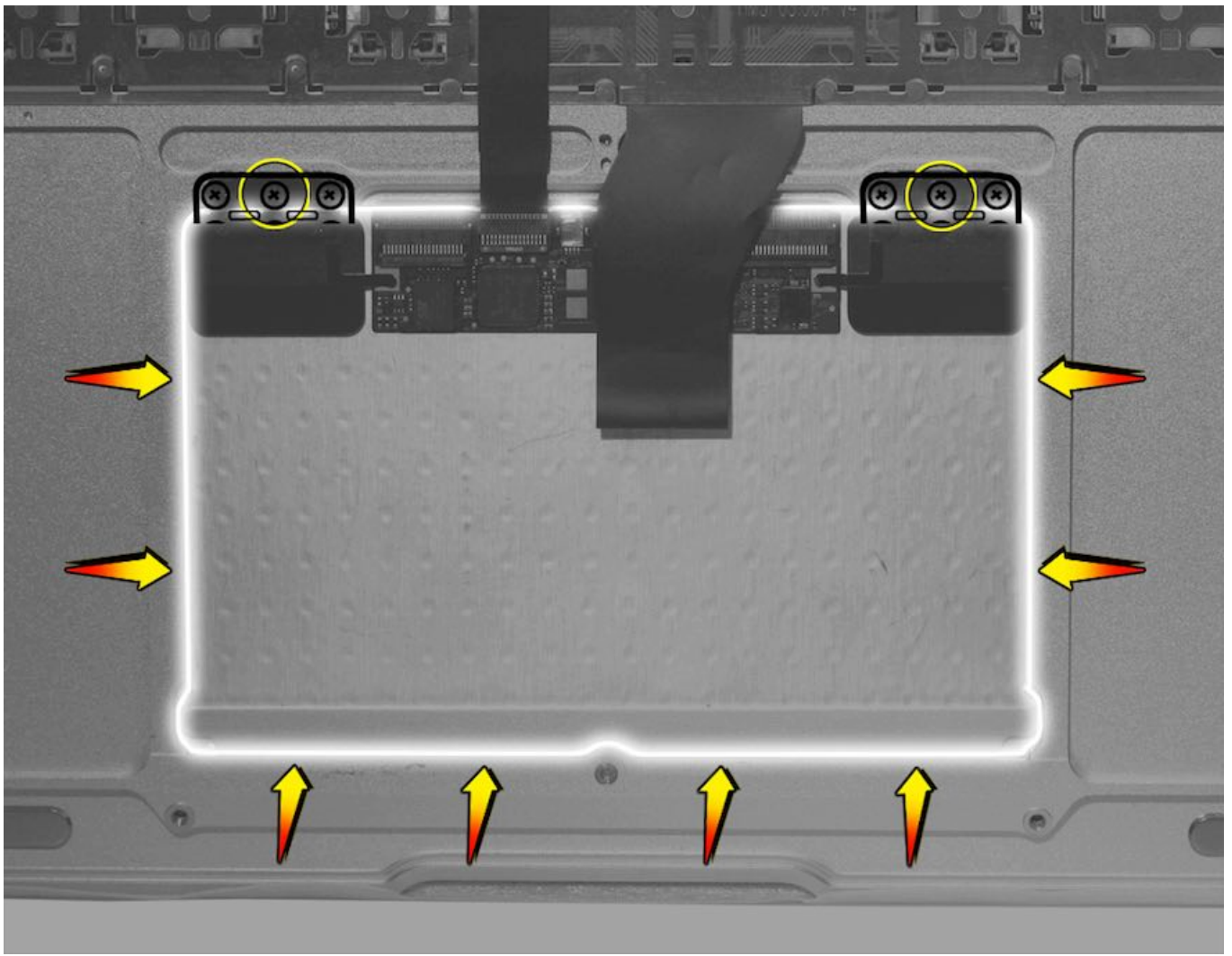
Important: Keyboard flex cable MUST lie flat. Very high bond (VHB) adhesive holds bend in cable. If VHB adhesive or cable is compromised, trackpad alignment issues may occur. This may necessitate top case replacement.



4. Using screws from trackpad kit, loosely insert 6 screws in flexures. Do not tighten yet.

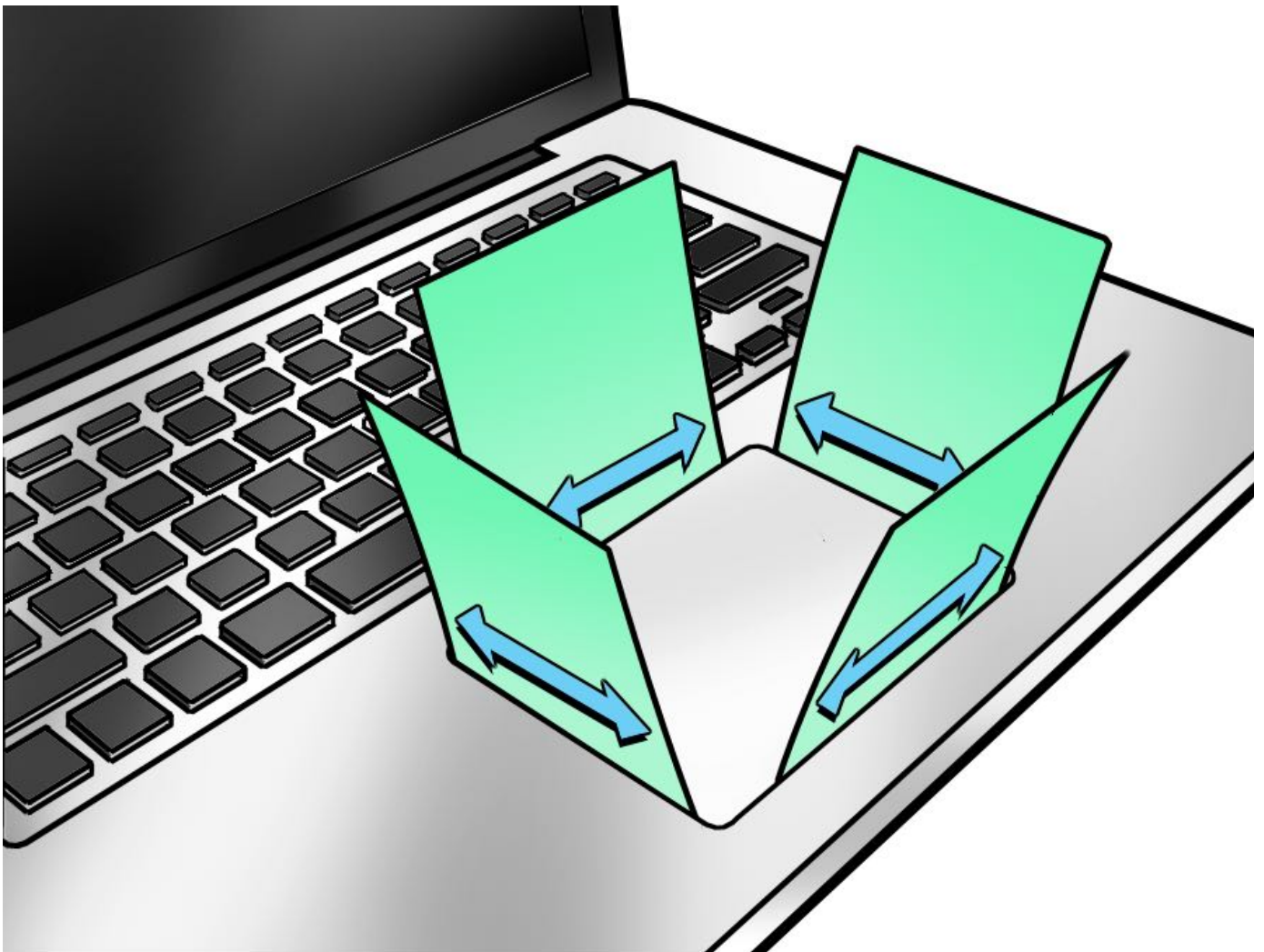


5. Check for even trackpad alignment at top, bottom, and sides by holding top case up to light. Look for even gaps.
6. With even gaps verified, tighten 2 center screws just enough to provide light tension on trackpad for easy alignment.



7. Prior to securing last 4 screws, double-check trackpad alignment using sticky (Post-it) notes on palm-rest side of trackpad. Insert **1** note into gap on top and sides of trackpad and **2** notes stacked on top of each other into gap on bottom of trackpad.

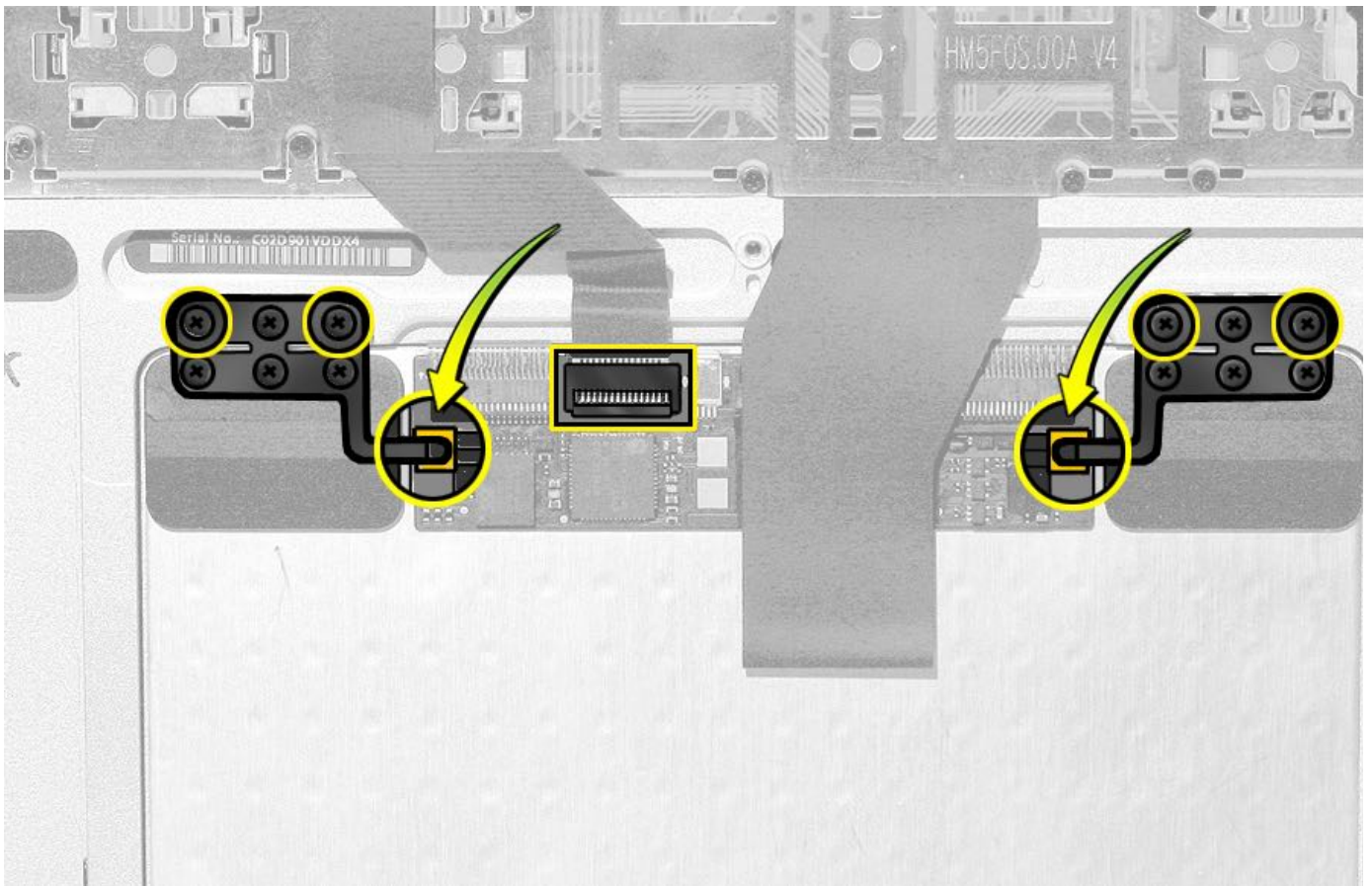
8. Slide notes back and forth on all four sides to assure even spacing.



9. Tilt up case to secure final 4 screws.

10. Make sure flexure arms are touching the copper pads.

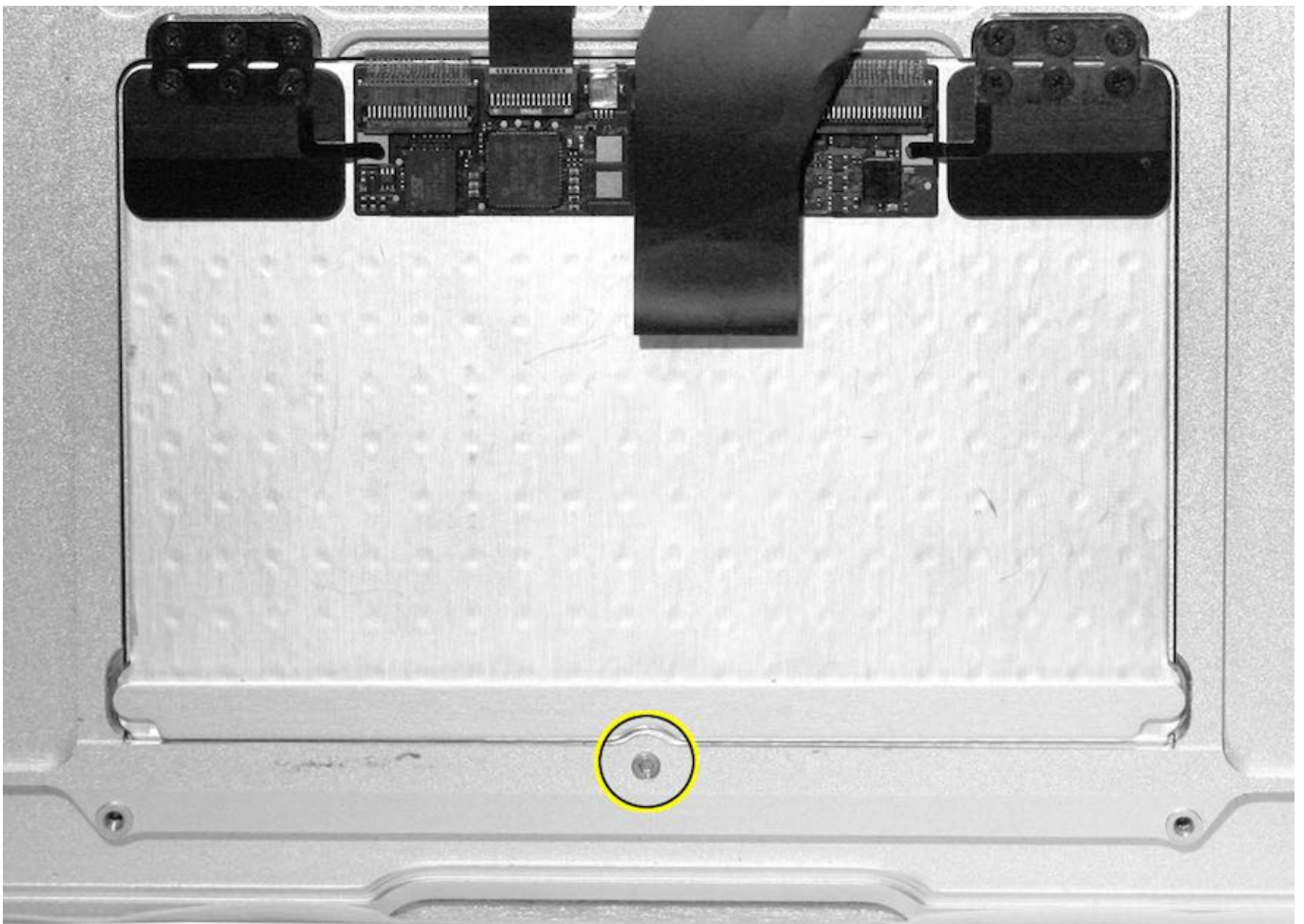
11. Connect IPD flex cable.



12. If you are installing trackpad in a new top case, loosely adjust T5 set screw, 922-9732 (1.47 mm), and go to next step.

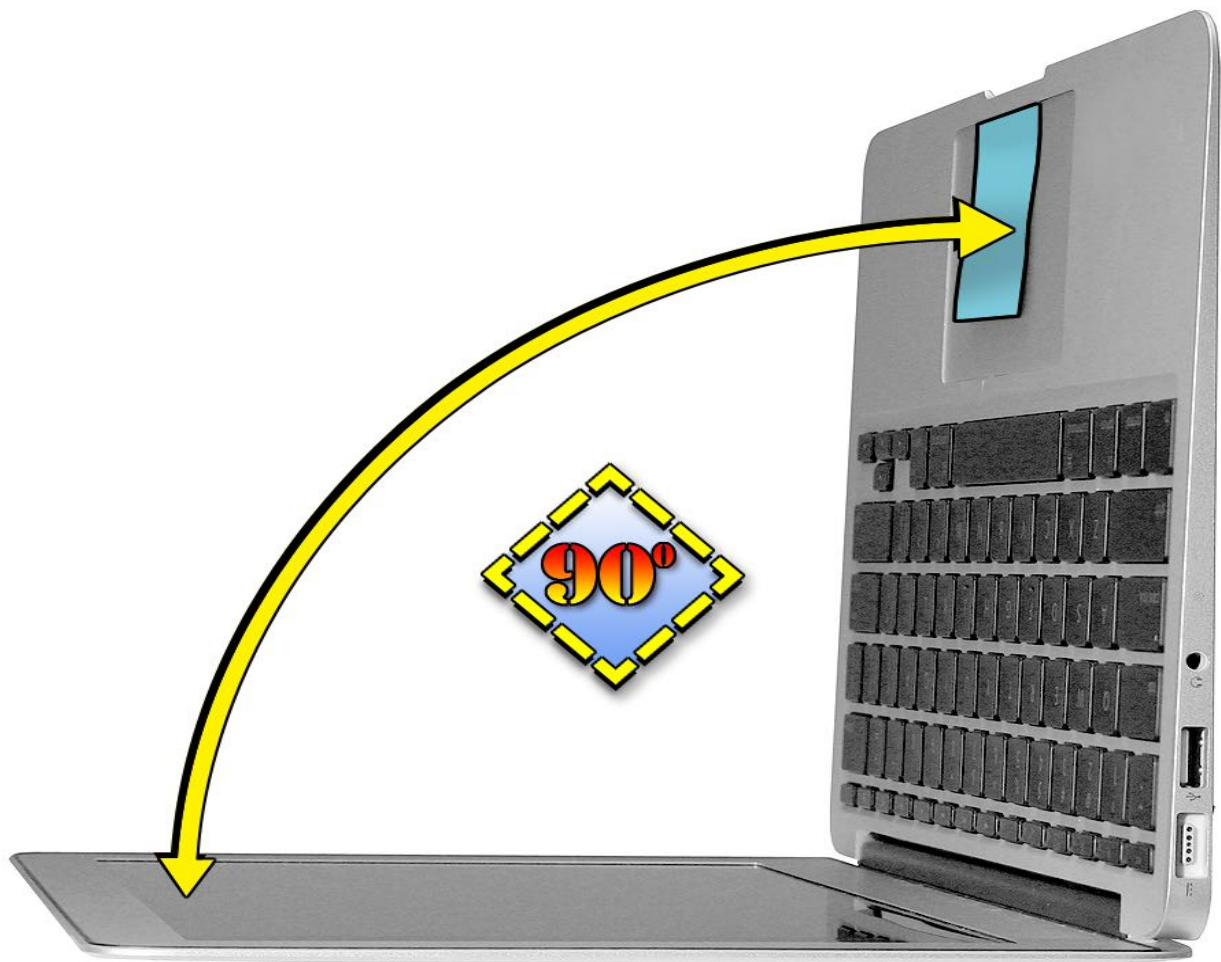


Important: If you are installing trackpad in existing top case, do not adjust set screw, but check trackpad for normal clicking motion and reassemble computer.



13. Place top case vertically and align 1 sticky note to bottom edge of trackpad.

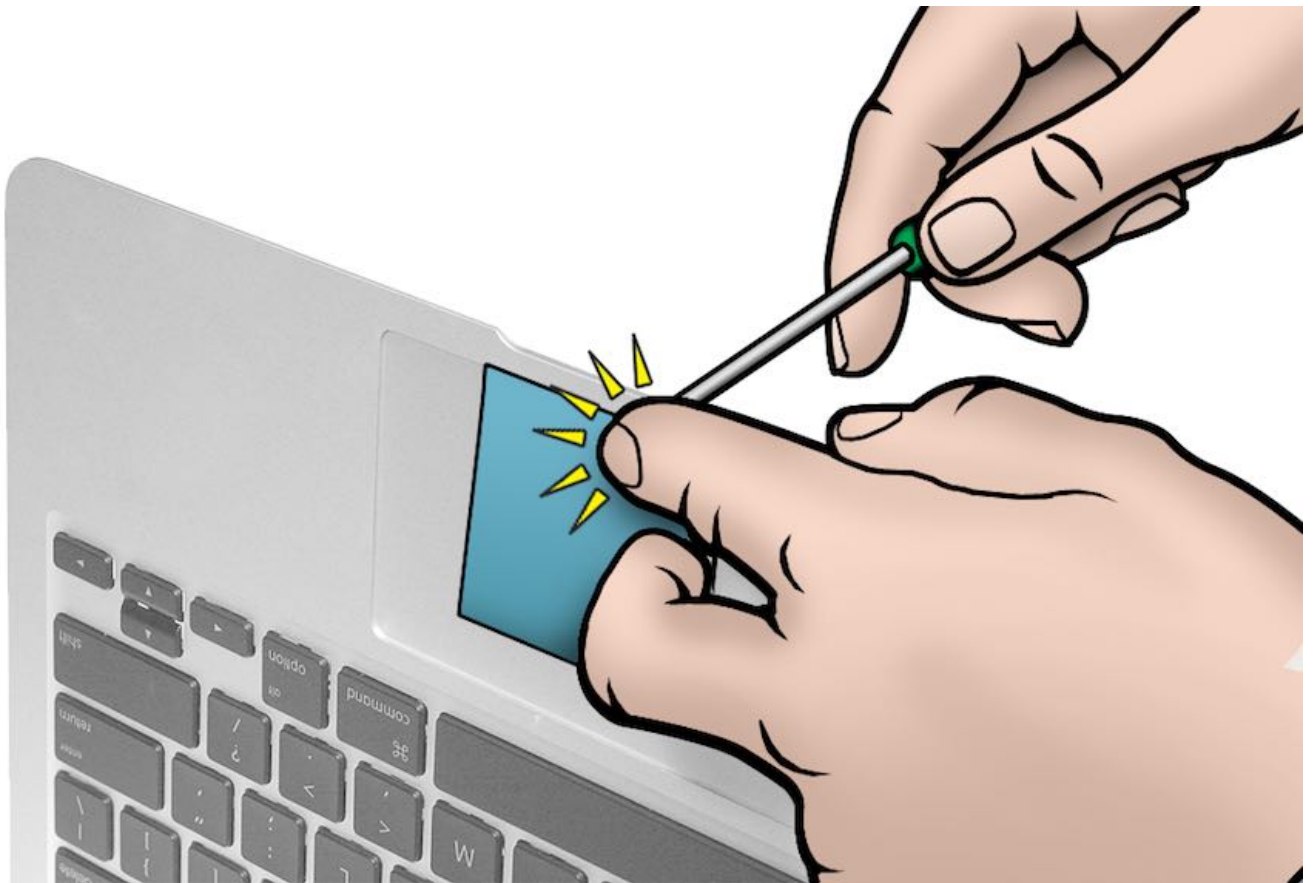
Note: Do not insert note into gap between trackpad and top case; just align edge of note with edge of trackpad.



14. With one hand on edge of sticky note and other hand slowly adjusting set screw, tighten screw just until sticky note on trackpad feels flush with top case.

Important: Overtightening set screw can damage trackpad.

15. Remove sticky note and check trackpad for normal clicking motion.



IMPORTANT: After replacing a Mid 2013 or Early 2014 trackpad, you must use Trackpad Keyboard Mapper to ensure trackpad is coded to match keyboard version. For more information, refer to Apple Support article [TP1016: AST Reference Guide: Using the Trackpad Keyboard Mapper](#).

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Display Clamshell

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV166: Display Clamshell Replacement Video](#).

Remove:

- [Bottom Case](#)

For MacBook Air (13-inch, Mid 2013 and Early 2014), also remove:

- [I/O Flex Cable](#)
- [Fan](#)



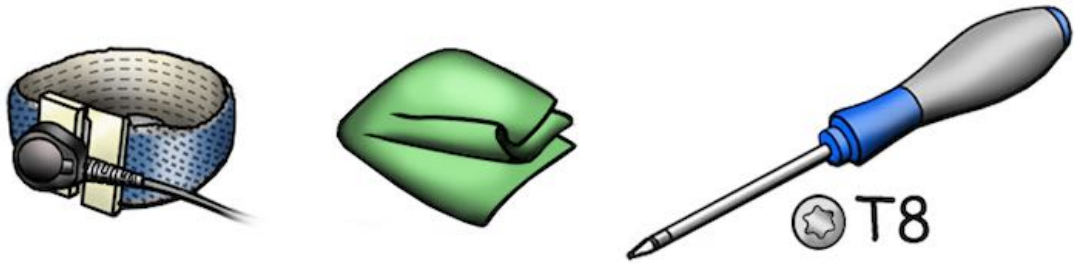
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Torx T8 screwdriver, magnetized

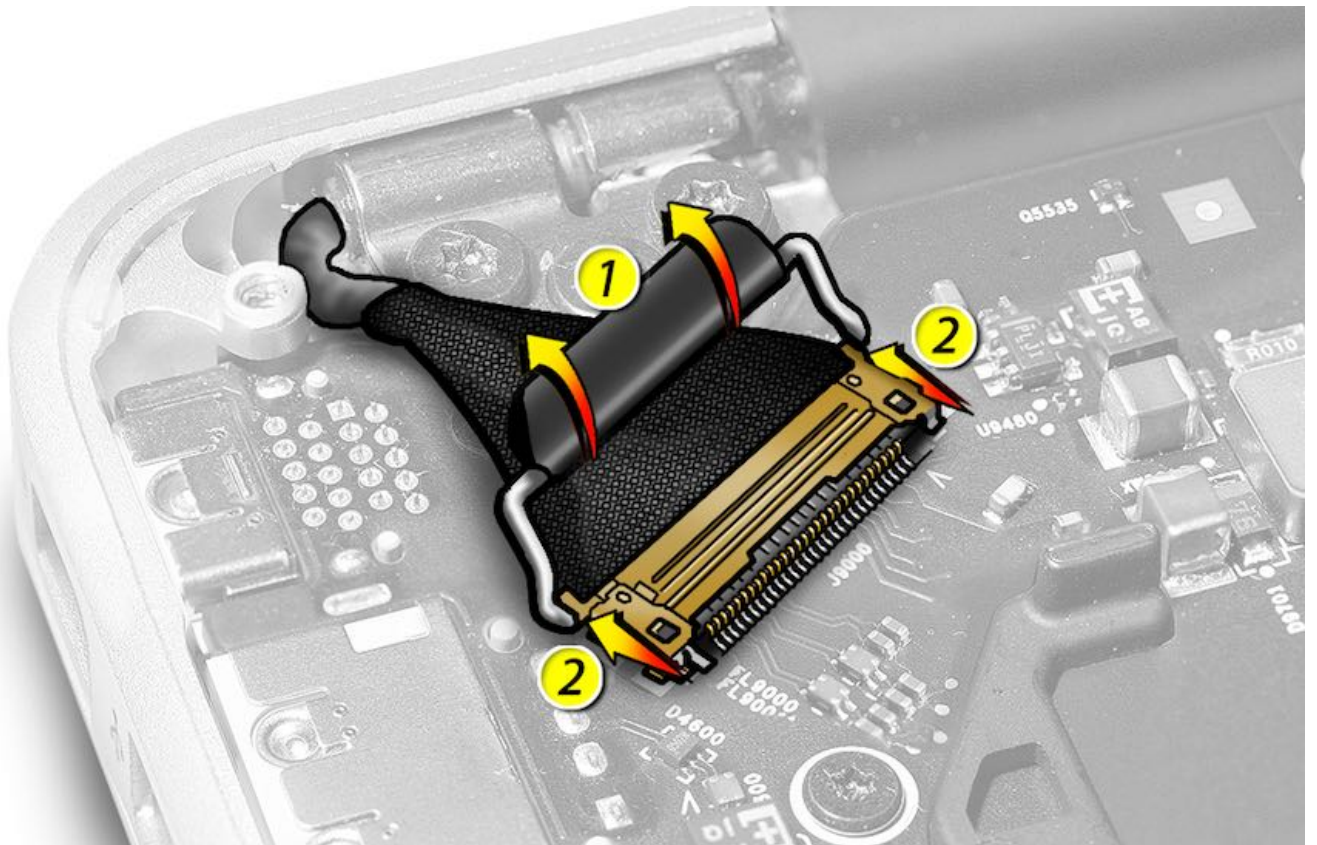


Steps For Removal

1. Place display clamshell (open to 90 degrees) so it safely hangs over a clean, padded table edge.

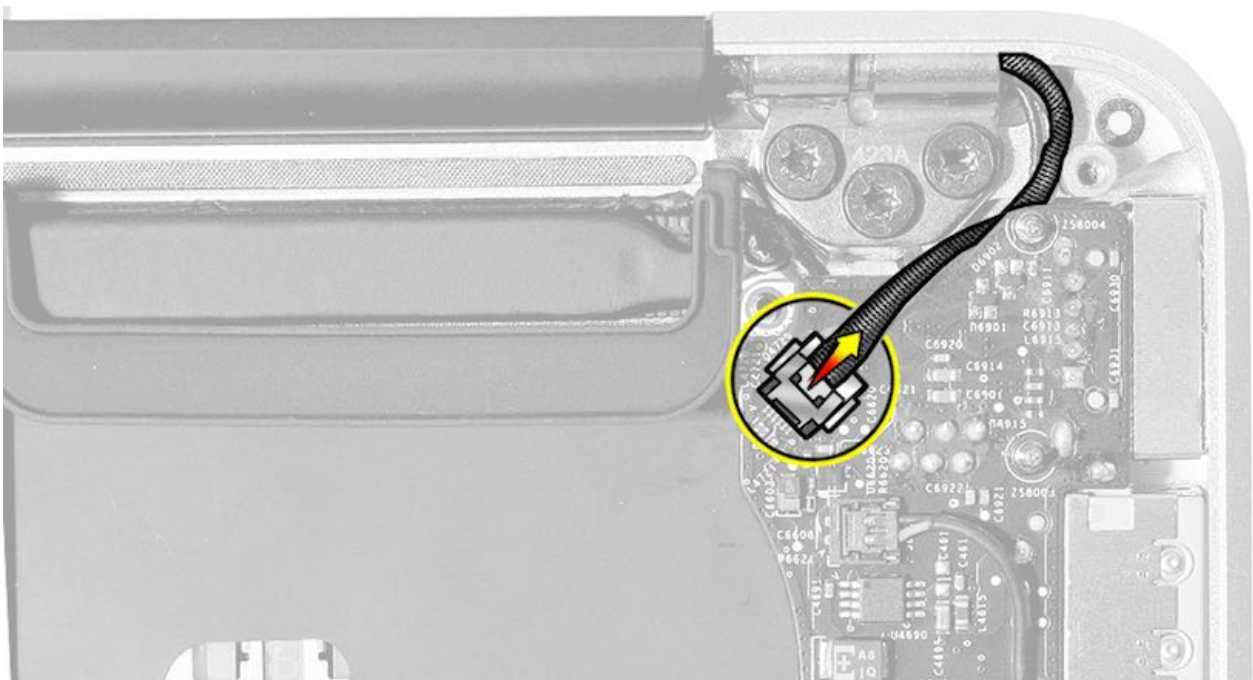


2. Disconnect display cable from logic board.
 - Gently flip up lock bar to unlock connector (1).
 - Use black stick or fingernail to disconnect display cable (2).



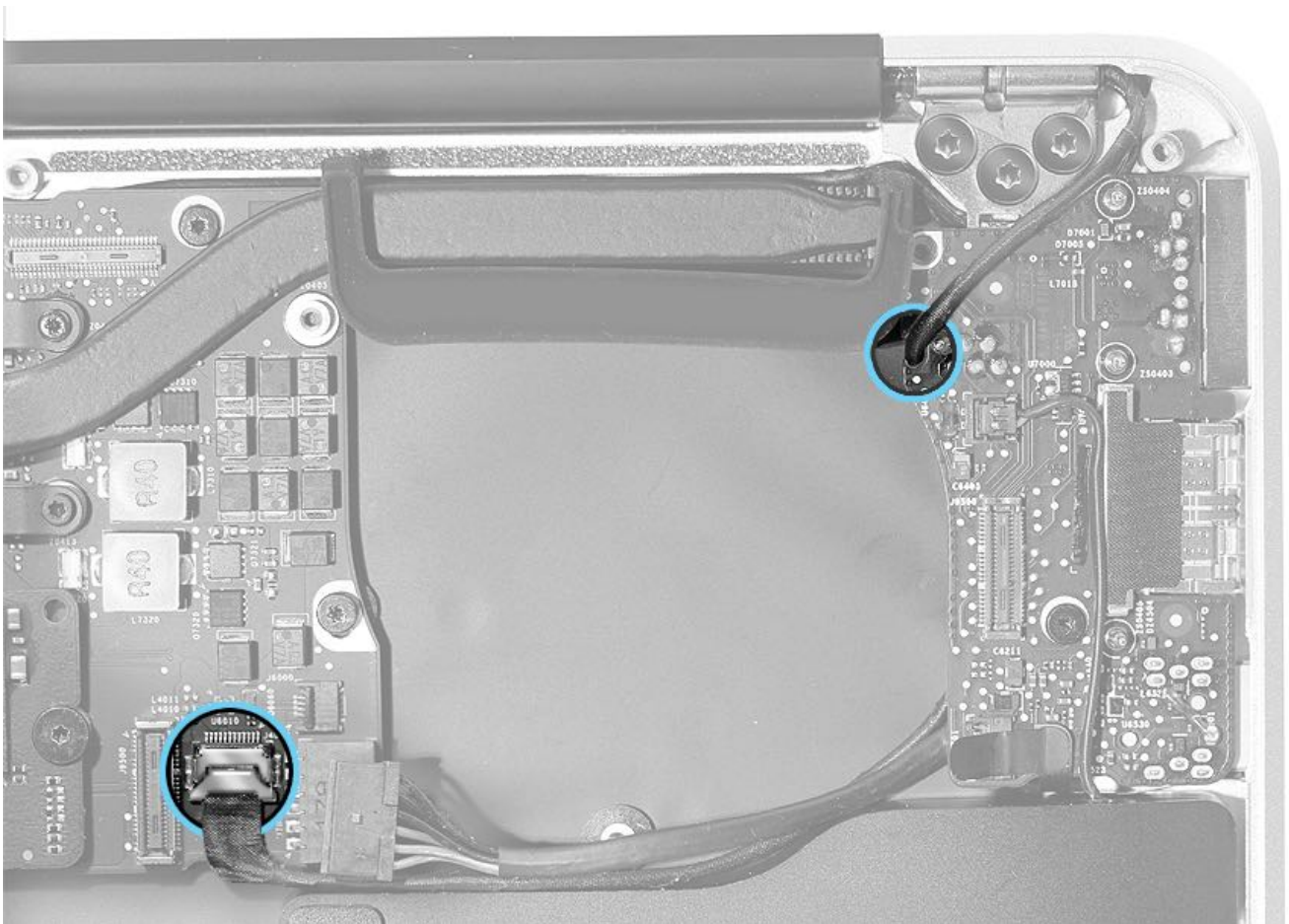
MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012)

3. Disconnect camera cable from I/O board.

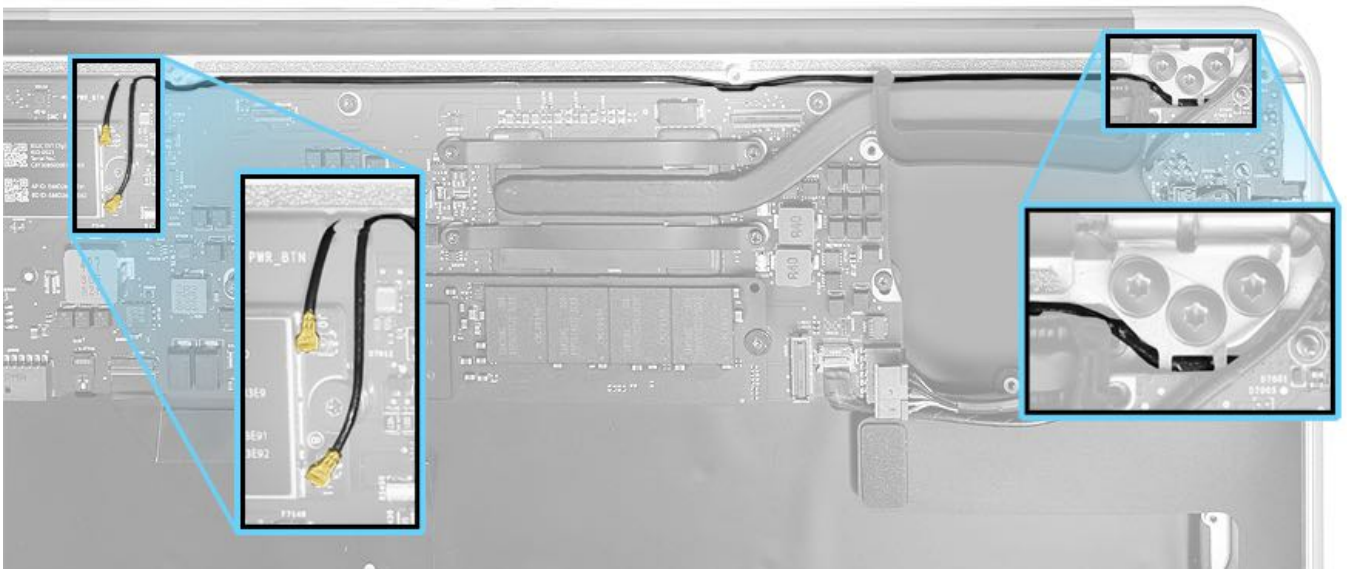


MacBook Air (13-inch, Mid 2013 and Early 2014)

3. Disconnect camera cable from logic board and remove cable from notch in I/O board.



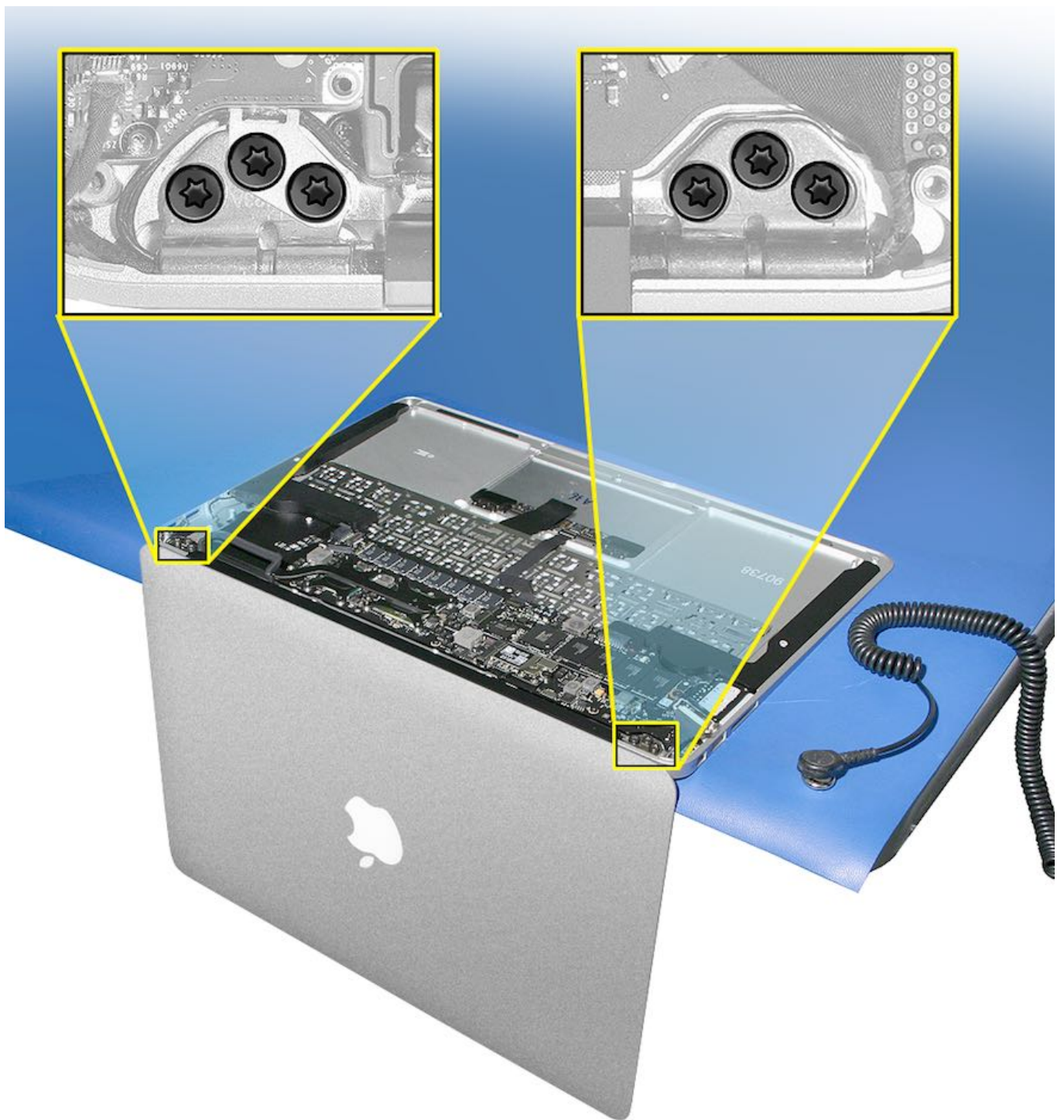
4. Disconnect antennas from wireless card, remove antennas from notches in logic board, and gently pry antenna cable from channel on top case. Take note of cable routing around top right corner of fan and display hinge.



5. Remove 6 Torx T8 screws (3 at each clutch):

922-9652 (4.3 mm)

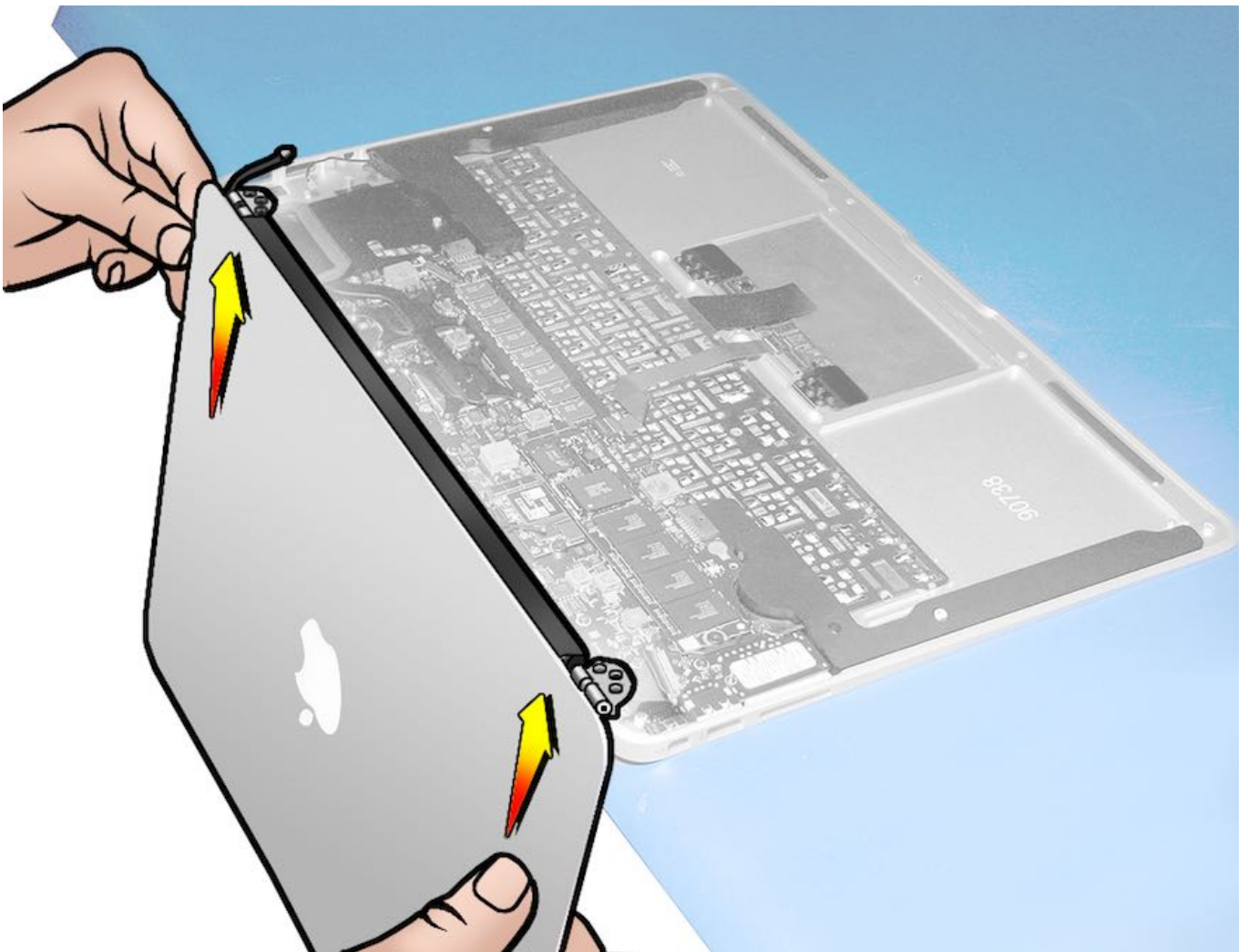




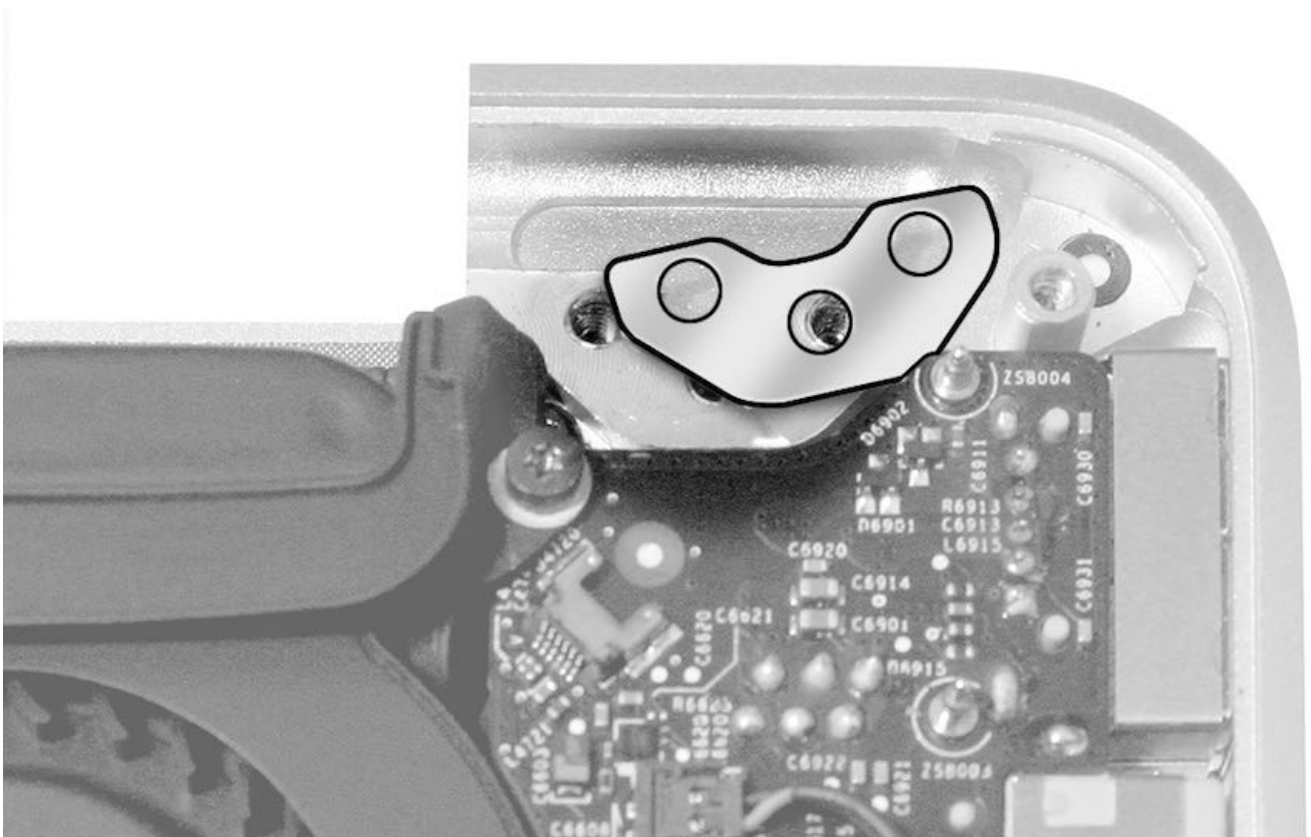
6. While supporting assembly, separate display clamshell from top case.

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012): As you lift display clamshell, look for a metal shim under each clutch (922-9649). See next step.

Note: MacBook Air (13-inch, Mid 2013 and Early 2014) computers do not include clutch shims.



7. MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012): Remove and save metal shim at each clutch.



Steps For Reassembly

Note: Steps 1-4 do not apply to MacBook Air (13-inch, Mid 2013 and Early 2014) computers.

1. Place shim under clutch and align screw holes with black stick.

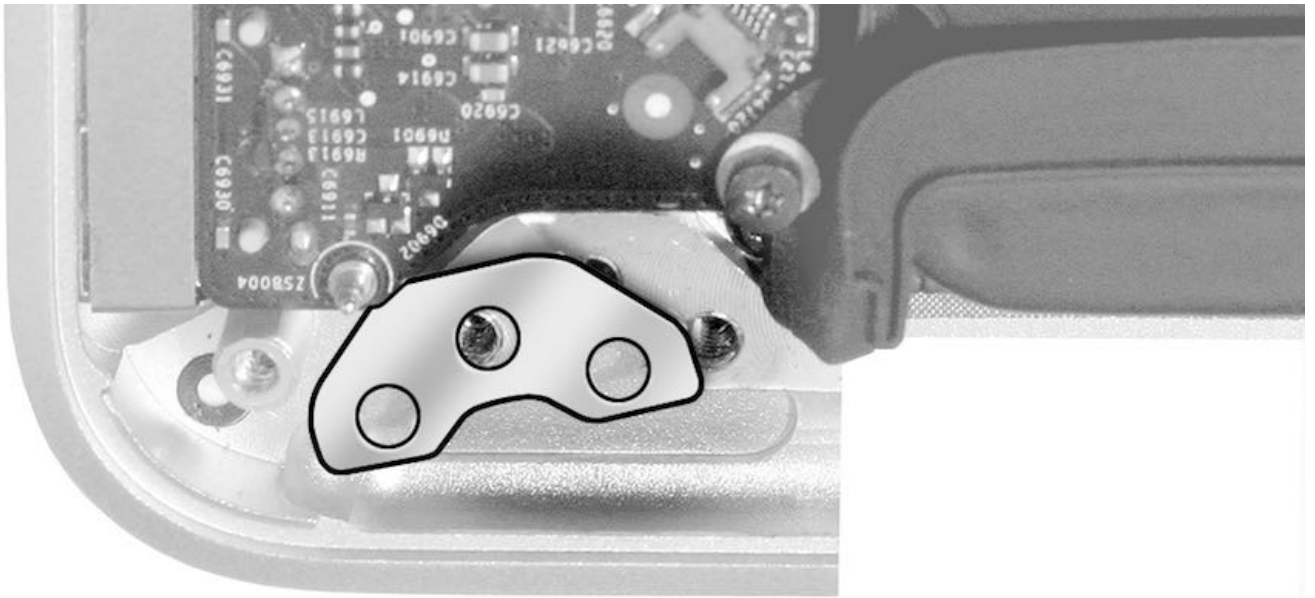


2. Loosely install middle screw.



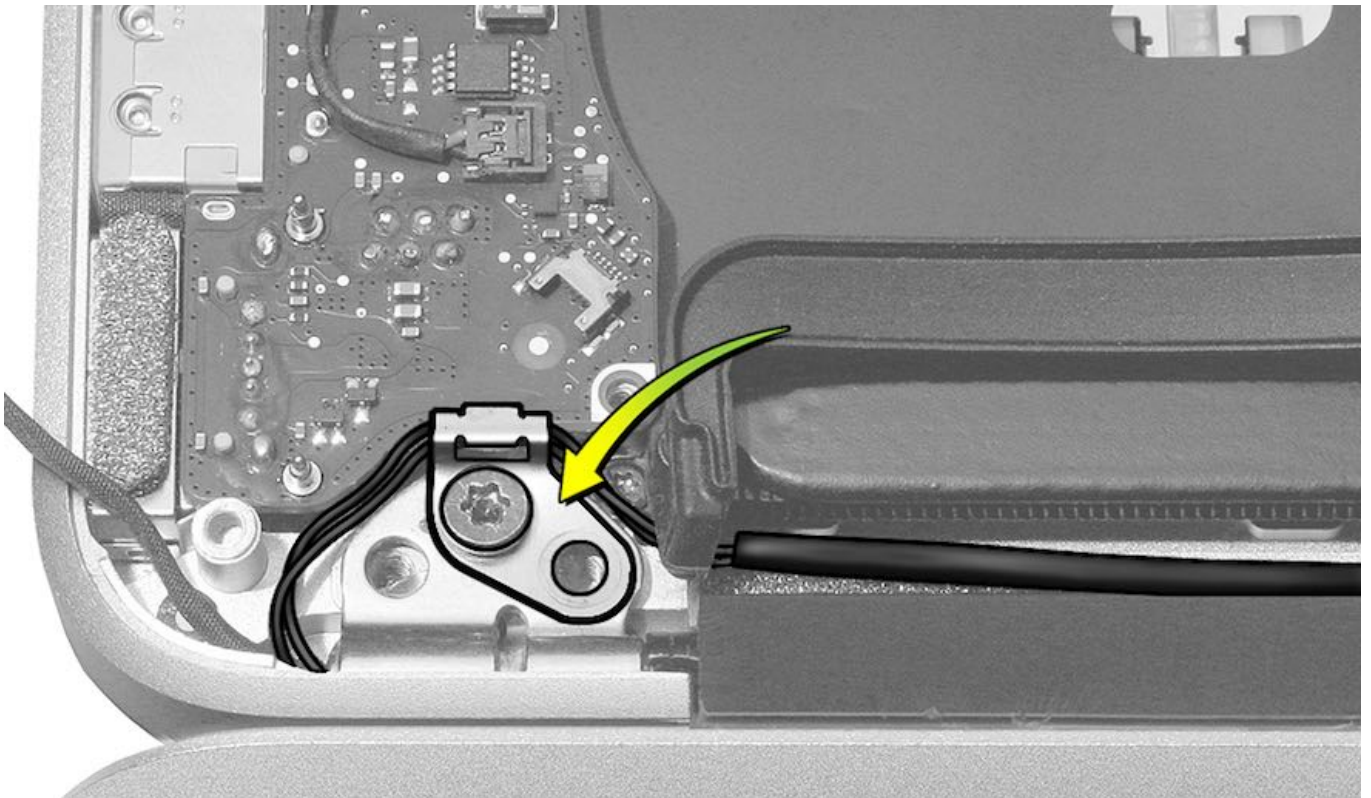
3. On the other clutch hinge, place shim onto top case. Align screw holes.

4. Place display clutch hinge on top of loose shim.

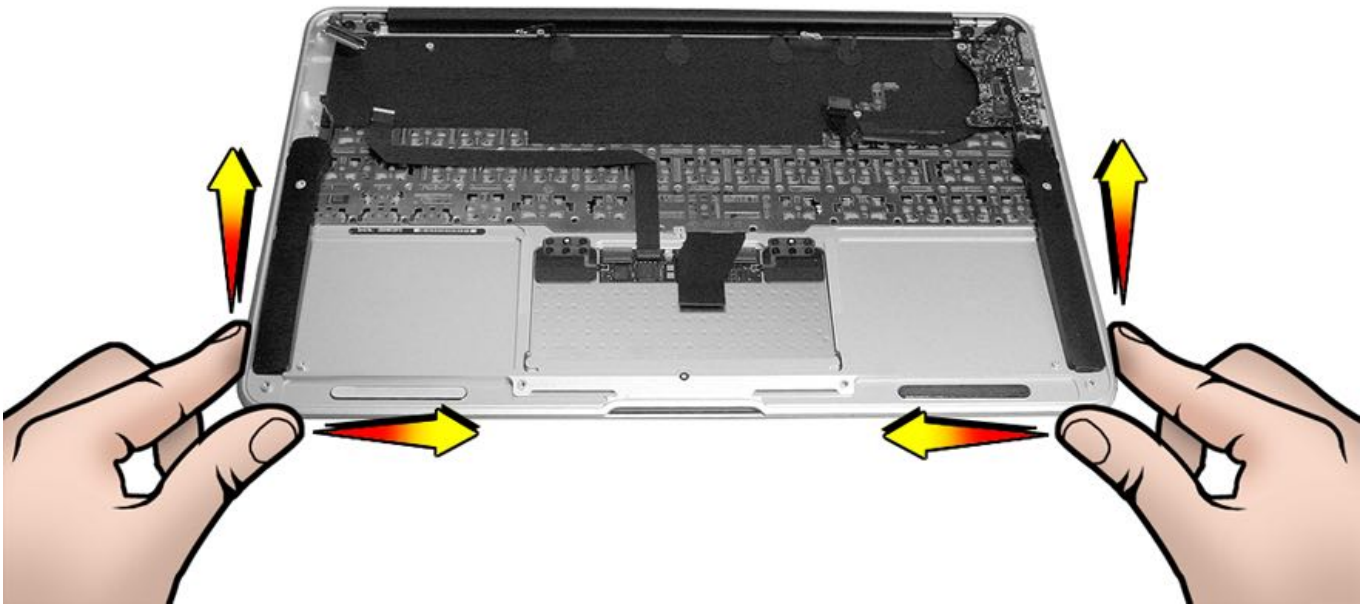


5. Place antenna ground clip on top of clutch hinge. Loosely install middle screw.

Caution: Incorrect placement of ground clip could cause cable damage.

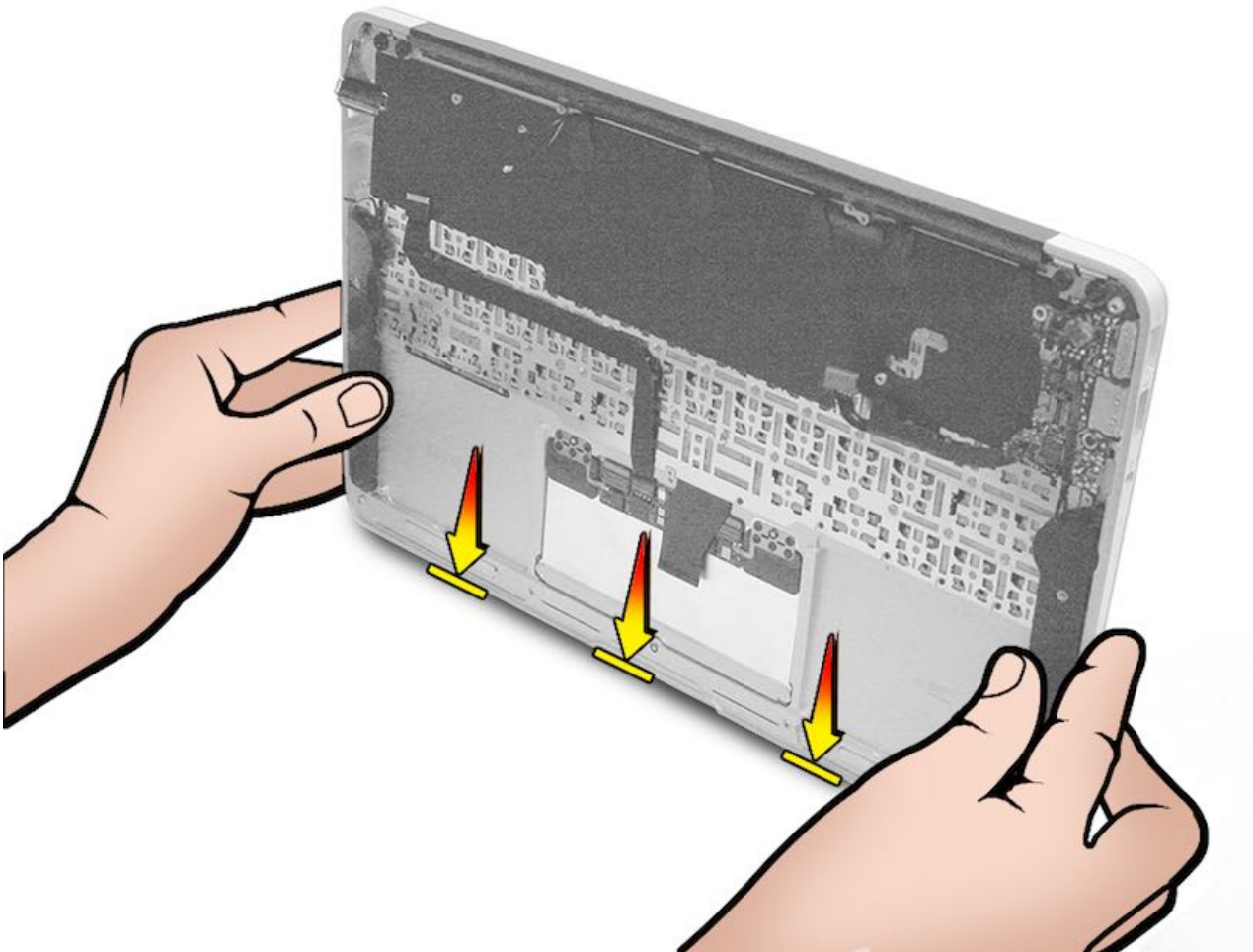


6. Adjust alignment by touch.

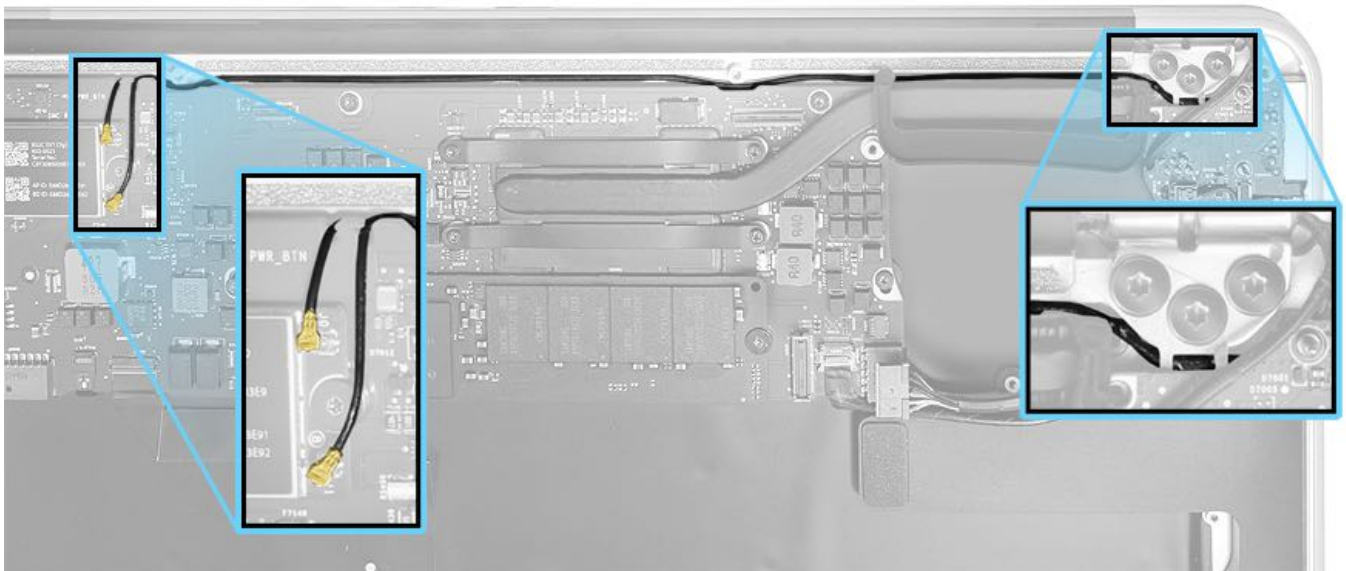


7. Stand up computer on a clean, flat surface to level front-to-rear clutch alignment.

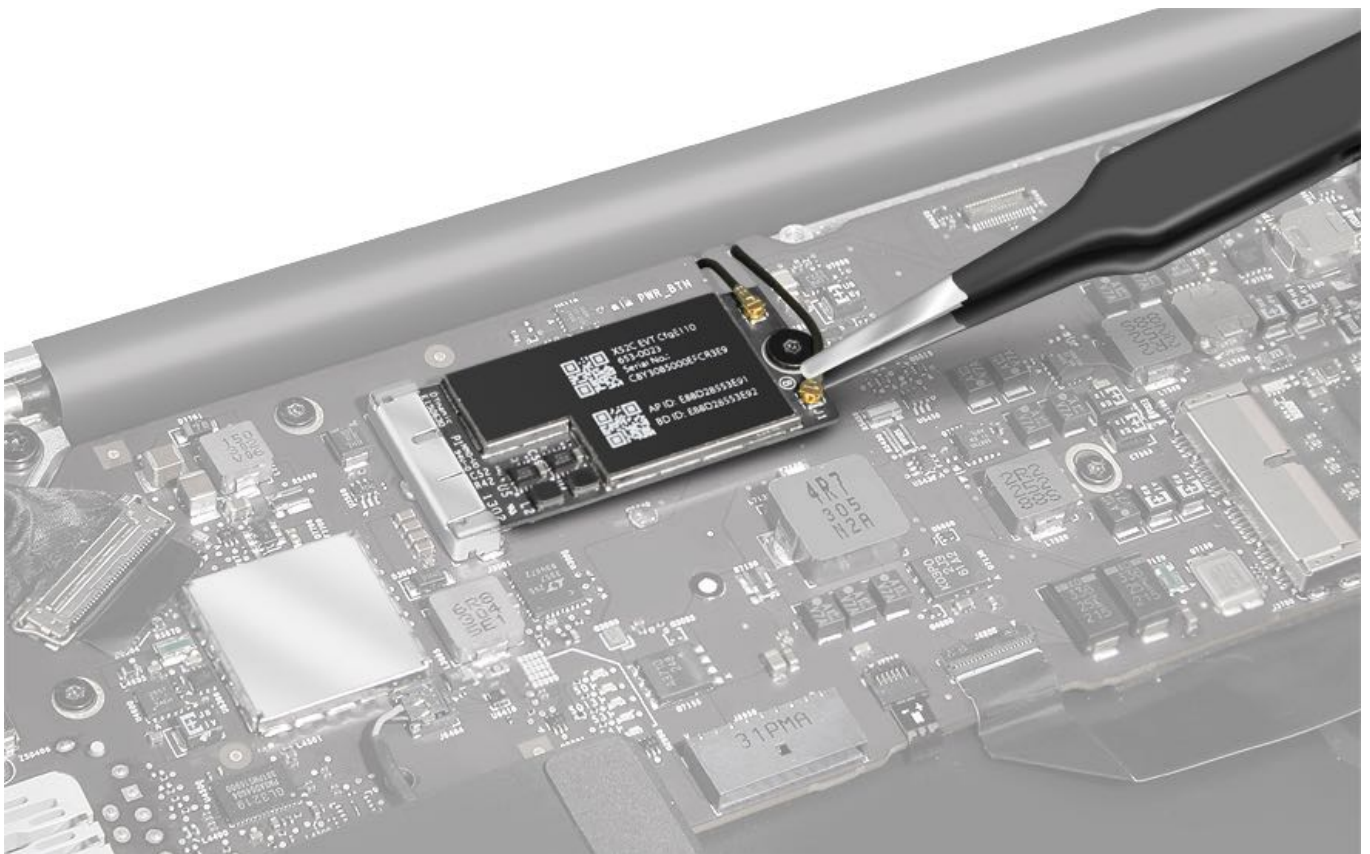
8. Tighten 6 T8 clutch hinge screws.



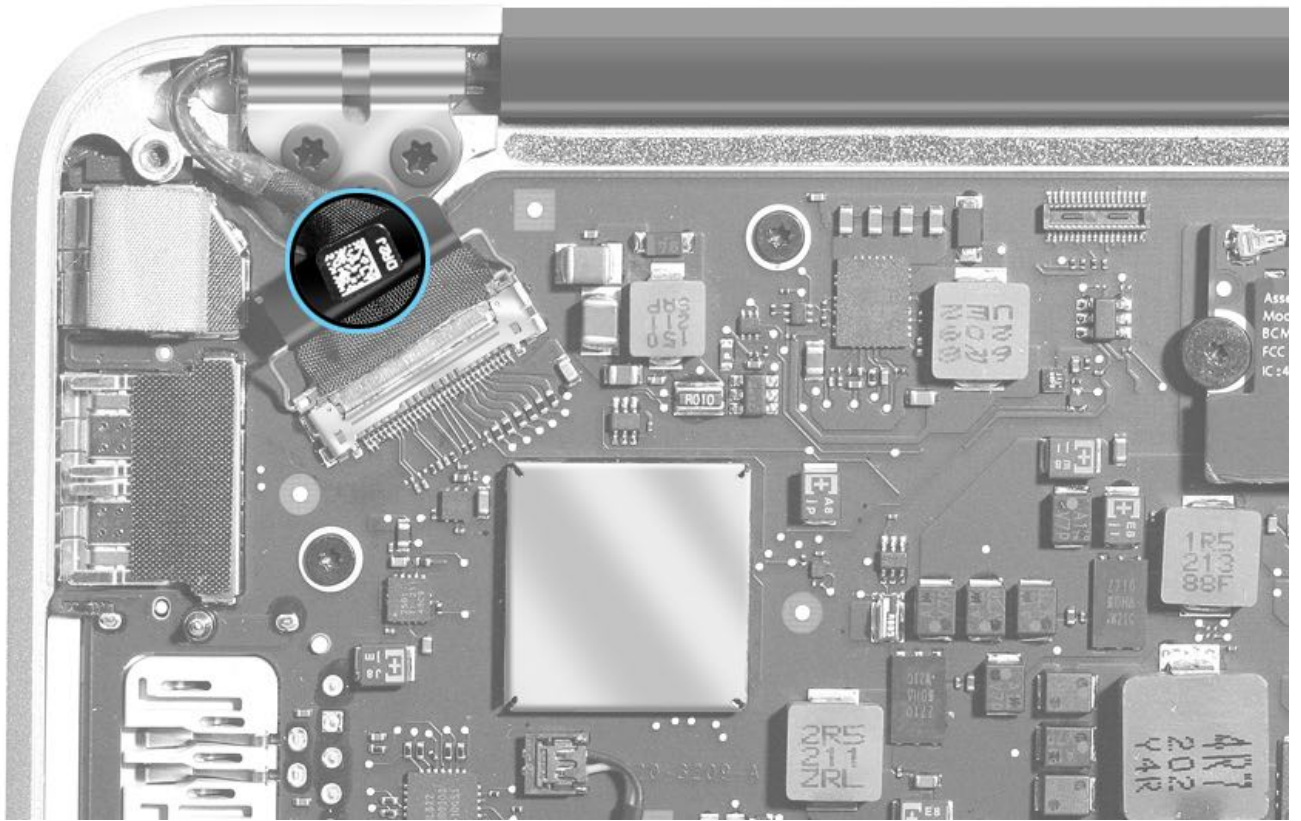
9. Route antenna cable into channel on top case. Continue routing antenna to the left, tucking it into channel.



10. Connect antennas to AirPort/Bluetooth or wireless card.



Note: MacBook Air (13-inch, Mid 2012, Mid 2013, Early 2014) computers include a 2D barcode of the display clamshell serial number on the underside of the pull tab for the EDP cable. The barcode links the display clamshell to the system serial number.



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Display Clutch Cover

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

For video instruction, refer to Apple Support article [SV167: Display Clutch Replacement Video](#).

Remove:

- [Bottom Case](#)
- [Display Clamshell](#)

For MacBook Air (13-inch, Mid 2013 and Early 2014), also remove:

- [I/O Flex Cable](#)
- [Fan](#)



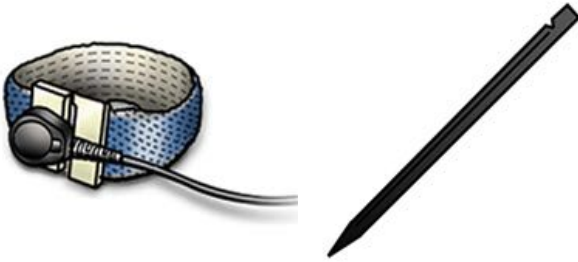
Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Clutch cover kit that includes left/right adhesive strips

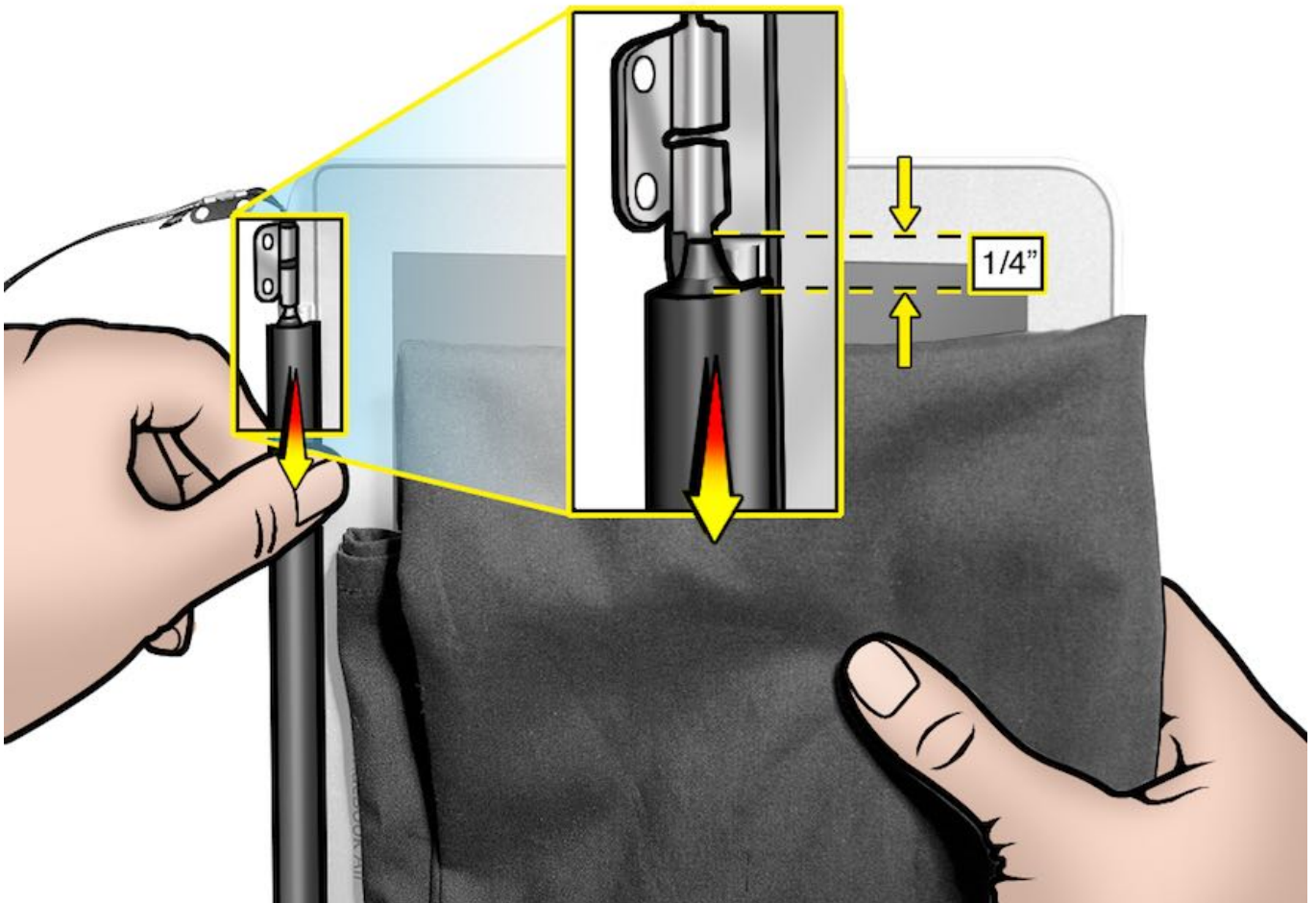


Steps For Removal

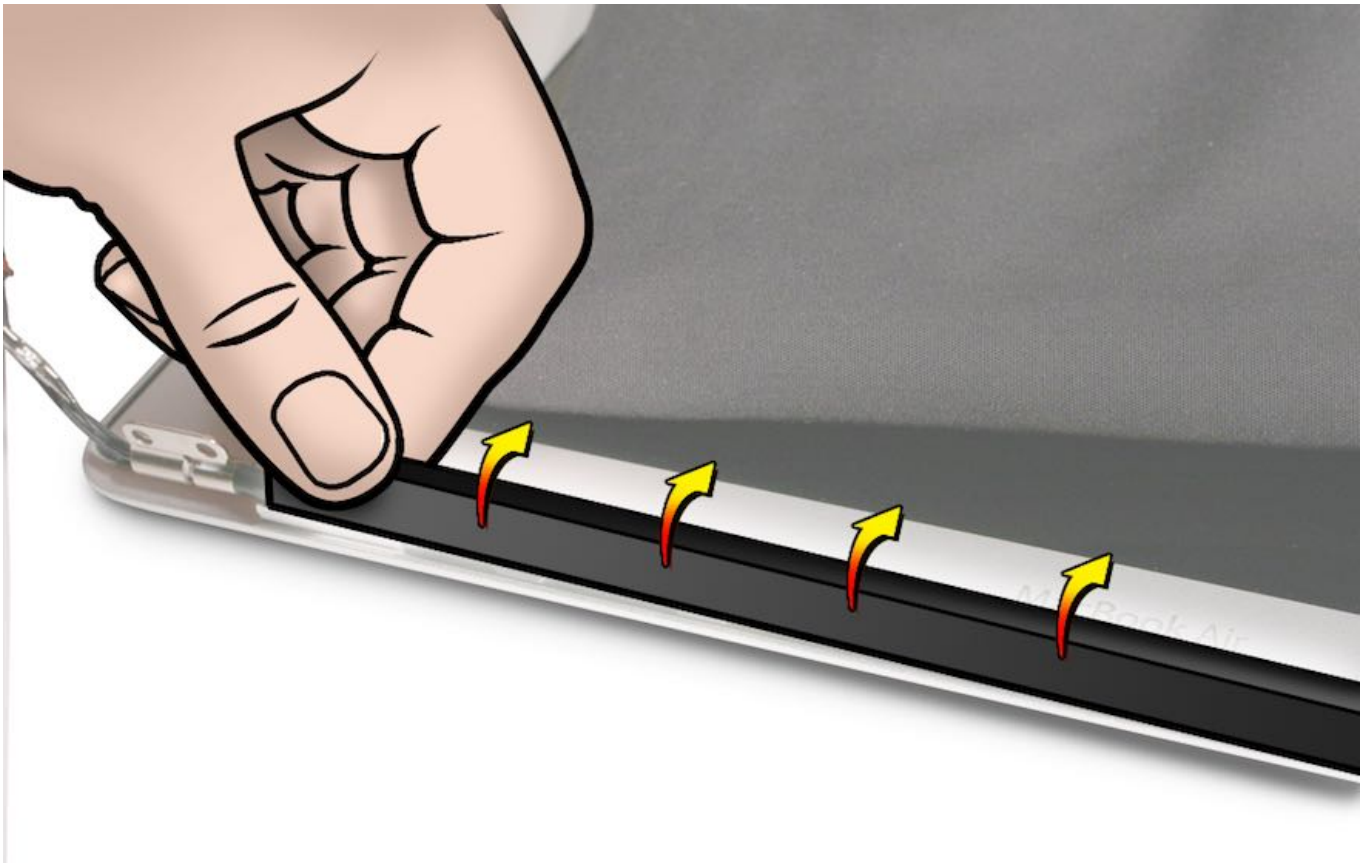
Note: Although this procedure shows some MacBook Air (11-inch, Late 2010) images, the steps are the same for the MacBook Air (13-inch, Mid 2011, Mid 2012, Mid 2013, Early 2014).

1. Cover display face with clean, soft cloth and hold display vertically.
2. Slide clutch cover 1/4 inch (6.35 mm) away from camera cable.

Note: If the clutch resists movement, insert a black stick in the crease to loosen any adhesive on the end of the clutch.

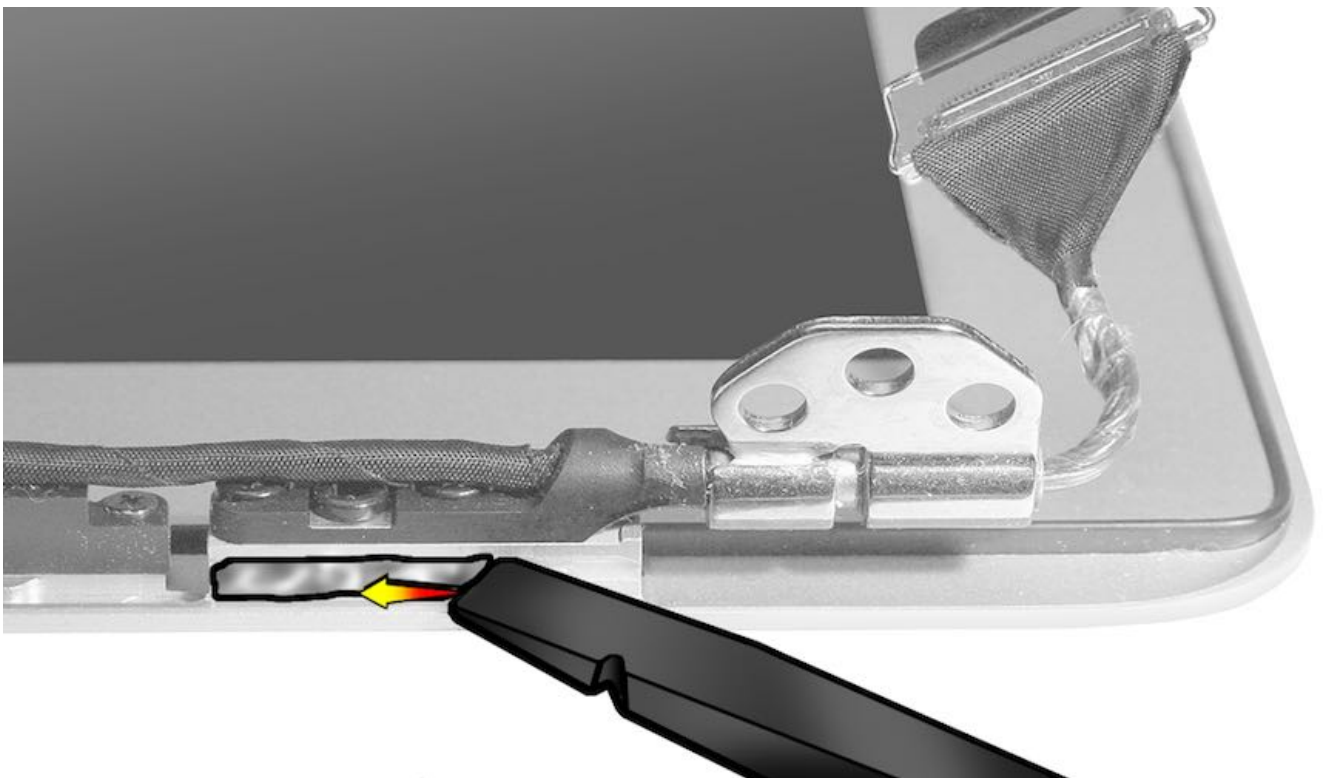


3. Place display clamshell on table.
4. Pinch and tilt up end of clutch cover as you roll it toward display face. Use a black stick to assist in the clutch cover removal.
5. Remove clutch cover.

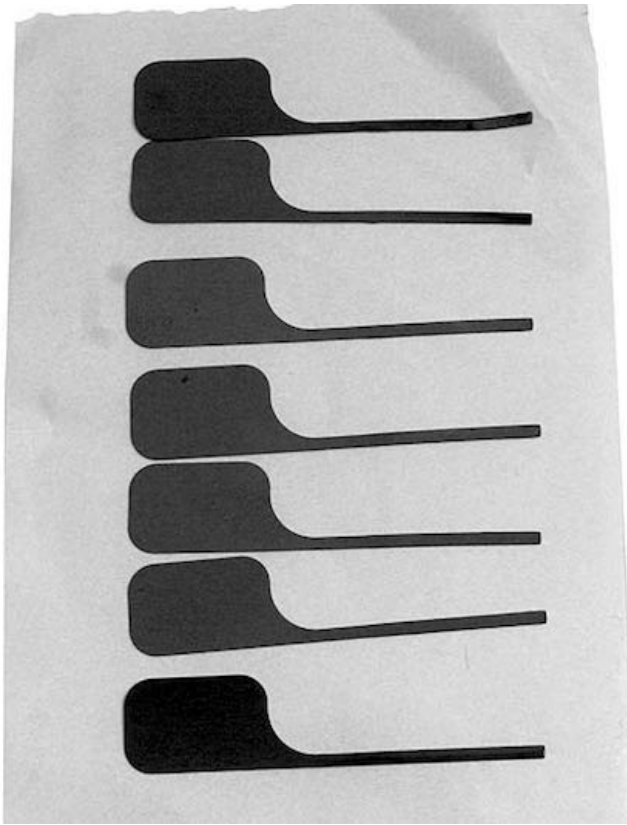


Steps For Reassembly

1. Clean residual VHB (very high bond) adhesive from both ends of display housing.

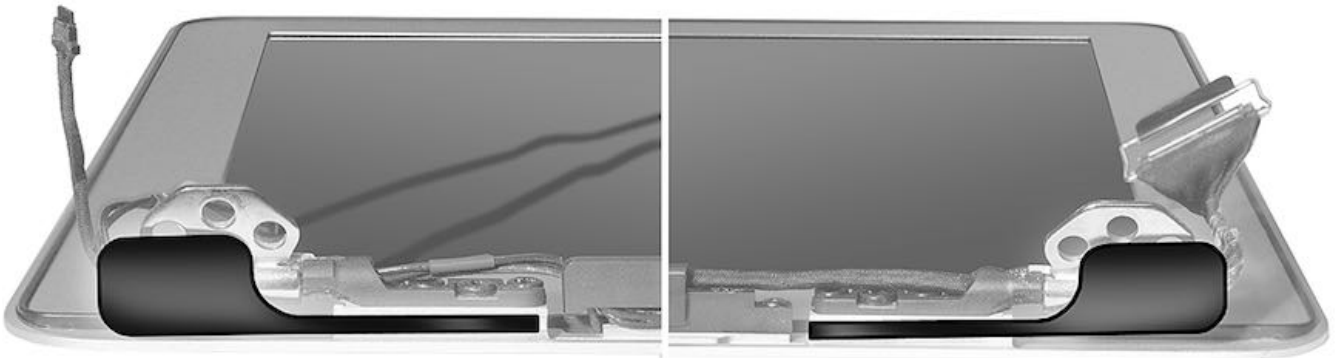


2. Notice the right and left VHB strips. You will use one for each display hinge.



3. Apply one VHB strip to each hinge mount.

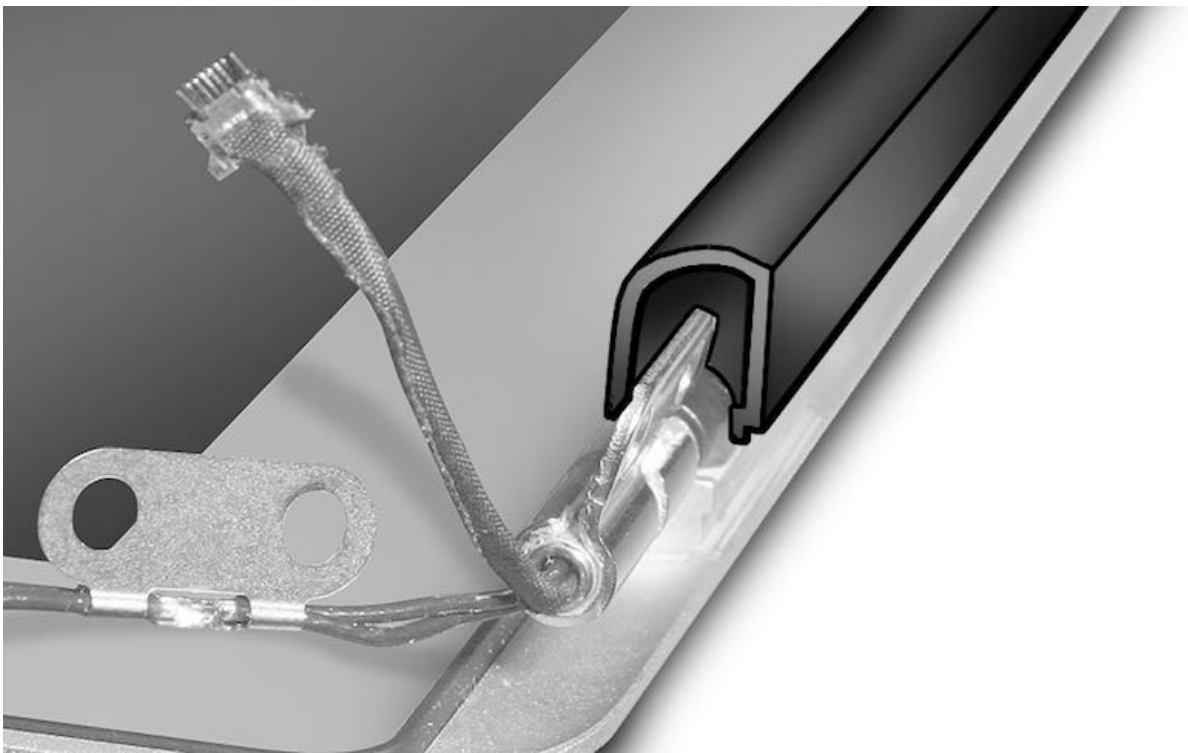
4. Keep the strips in place as you install the clutch cover.



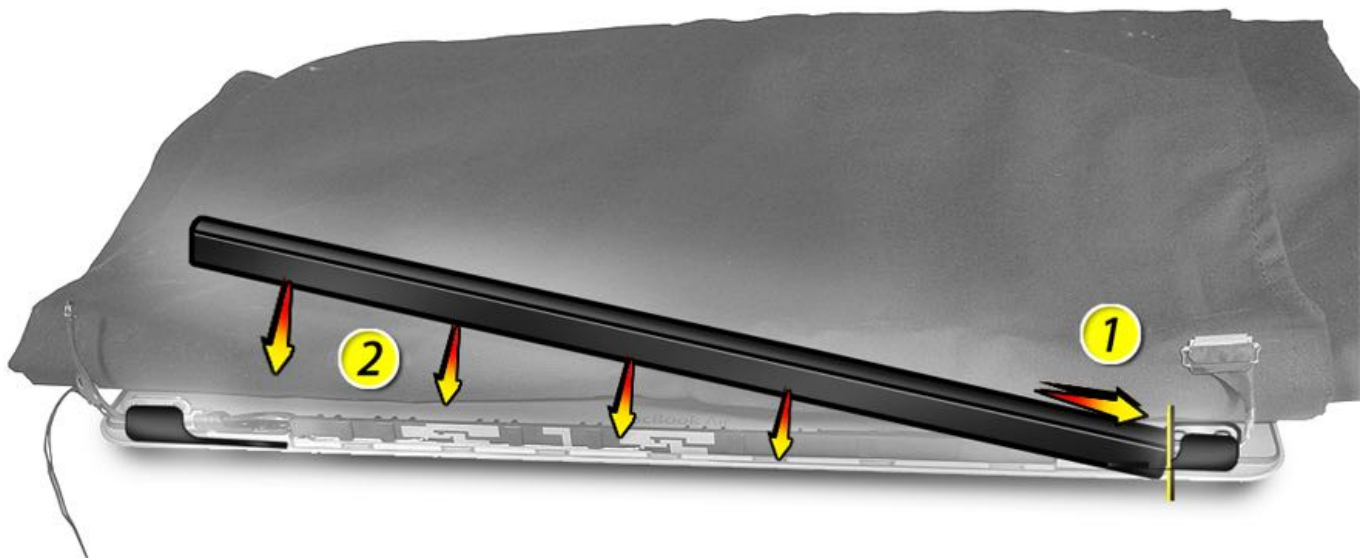
5. Note shape of clutch cover:

- Flat at bottom
- Curved at top

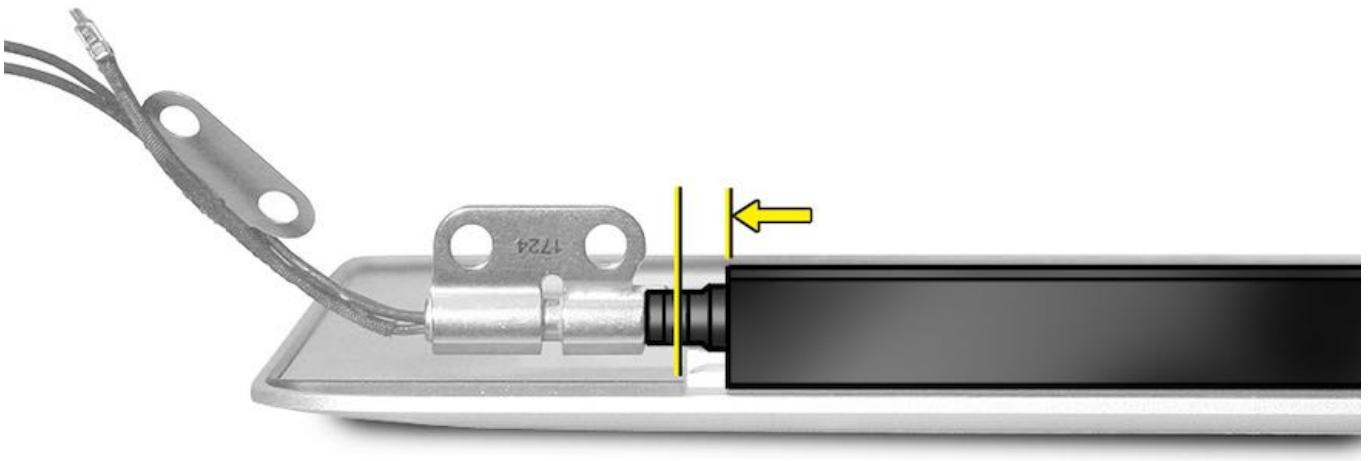
6. Make sure flat edge is at bottom of display.



7. Tilt clutch cover over right hinge mount.
8. Lower clutch cover onto display clamshell.
9. Listen for snapping sound as hooks engage.



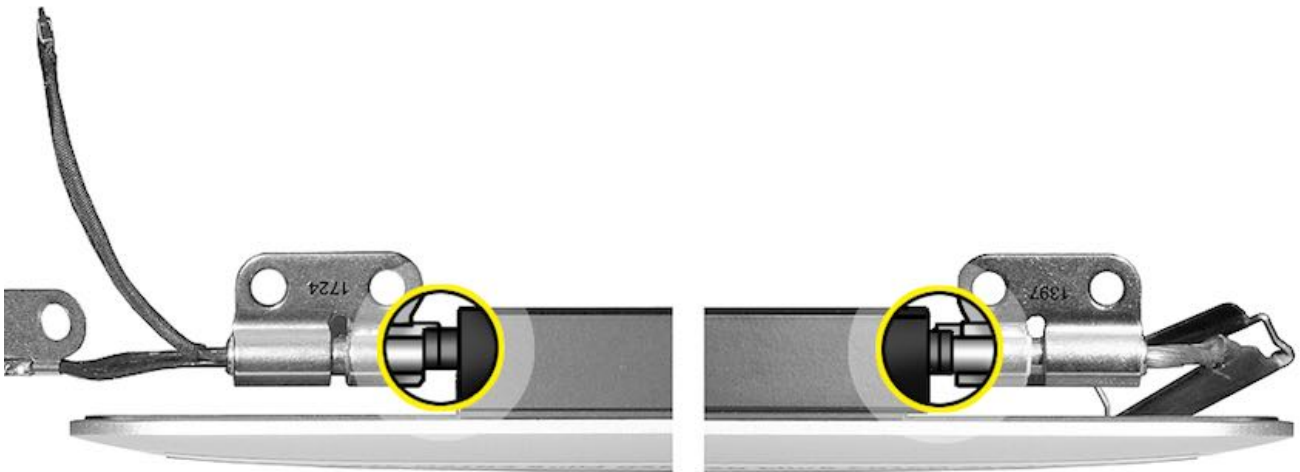
10. With the clutch cover engaged, slide it to the left to close the gap.
(VHB strip not shown.)



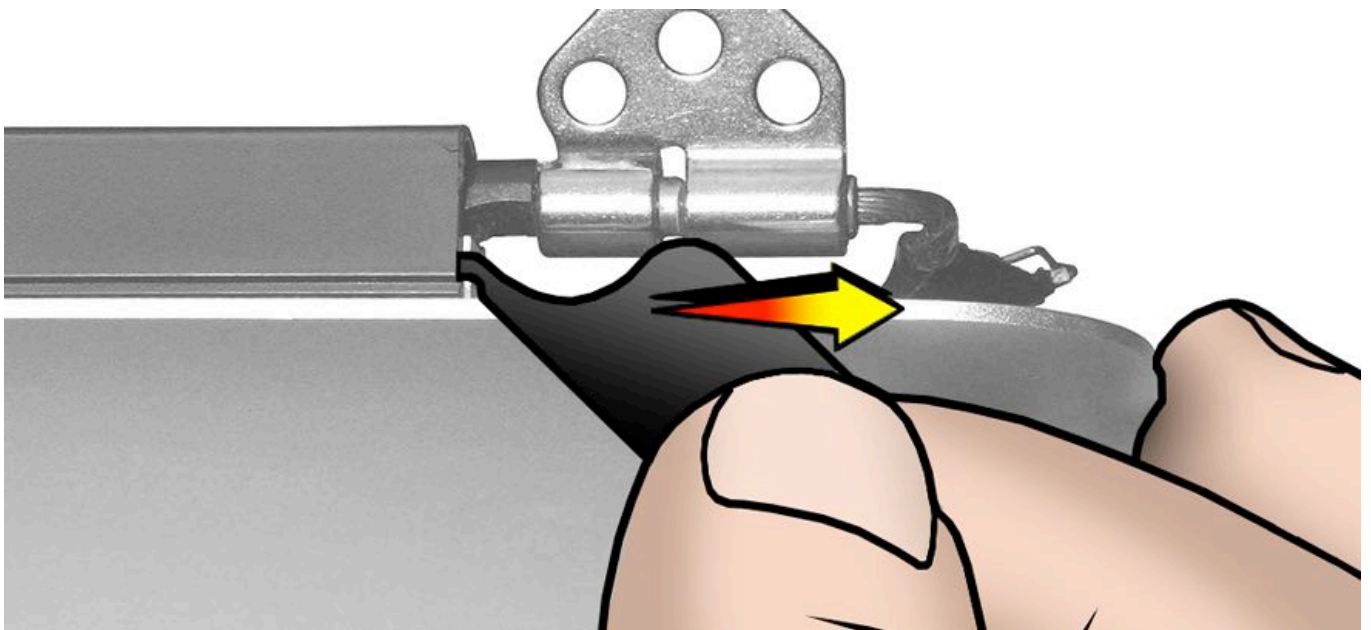
11. Check for good fit at both ends and across the clutch cover. Avoid:

- Gaps
- Bulges
- Pinched cables

(VHB strips not shown.)



12. With clutch cover fully installed, pull exposed tab on each side to remove VHB strips.



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Top Case with Keyboard

First Steps

Mid 2013 and Early 2014 models:

Before attempting this procedure, technicians must pass a qualification exam in addition to the ACMT certification. For more information, refer to Apple Support article [TP1017: Becoming Qualified for MacBook Air \(11-inch and 13-inch, Mid 2013 and Early 2014\) Repairs](#).

IMPORTANT: It is recommended you use the Trackpad Keyboard Mapper after replacing the Mid 2013 or Early 2014 top case. For more information, refer to Apple Support article [TP1016: AST Reference Guide: Using the Trackpad Keyboard Mapper](#).

For video instruction, refer to Apple Support article [SV168: Top Case Replacement Video](#) and [SV164: Microphone Replacement Video](#) (Mid 2012).

Remove and transfer:

- [Bottom Case](#)
- [Battery](#)
- [Right Speaker](#) (Late 2010)
- [Right Speaker](#) (Mid 2011, Mid 2012, Mid 2013, Early 2014)
- [Left Speaker](#)
- [SSD Card](#) (Late 2010)
- [SSD Card or Flash Storage](#) (Mid 2011, Mid 2012, Mid 2013, Early 2014)
- [I/O Flex Cable](#)
- [Fan](#)
- [Display Clamshell](#)
- [I/O Board](#) (Late 2010, Mid 2011, Mid 2012)
- [I/O Board](#) (Mid 2013 and Early 2014)
- [IPD Flex Cable](#) (Late 2010)
- [IPD Flex Cable](#) (Mid 2011, Mid 2012, Mid 2013, Early 2014)
- [Logic Board](#) (with Heat Sink and AirPort/Bluetooth or Wireless Card attached for Late 2010, Mid 2011, Mid 2012)
- [Logic Board](#) (with Heat Sink and Wireless Card attached for Mid 2013 and Early 2014)
- [Trackpad](#)



Important: Immediately after removing the bottom case, always attach the battery cover and disconnect the battery cable from the logic board.

Caution: Read [Battery Safety Precautions](#) before performing this procedure.



Tools

- Heat gun
- Knife
- Fine-tip permanent marker



Steps For Removal

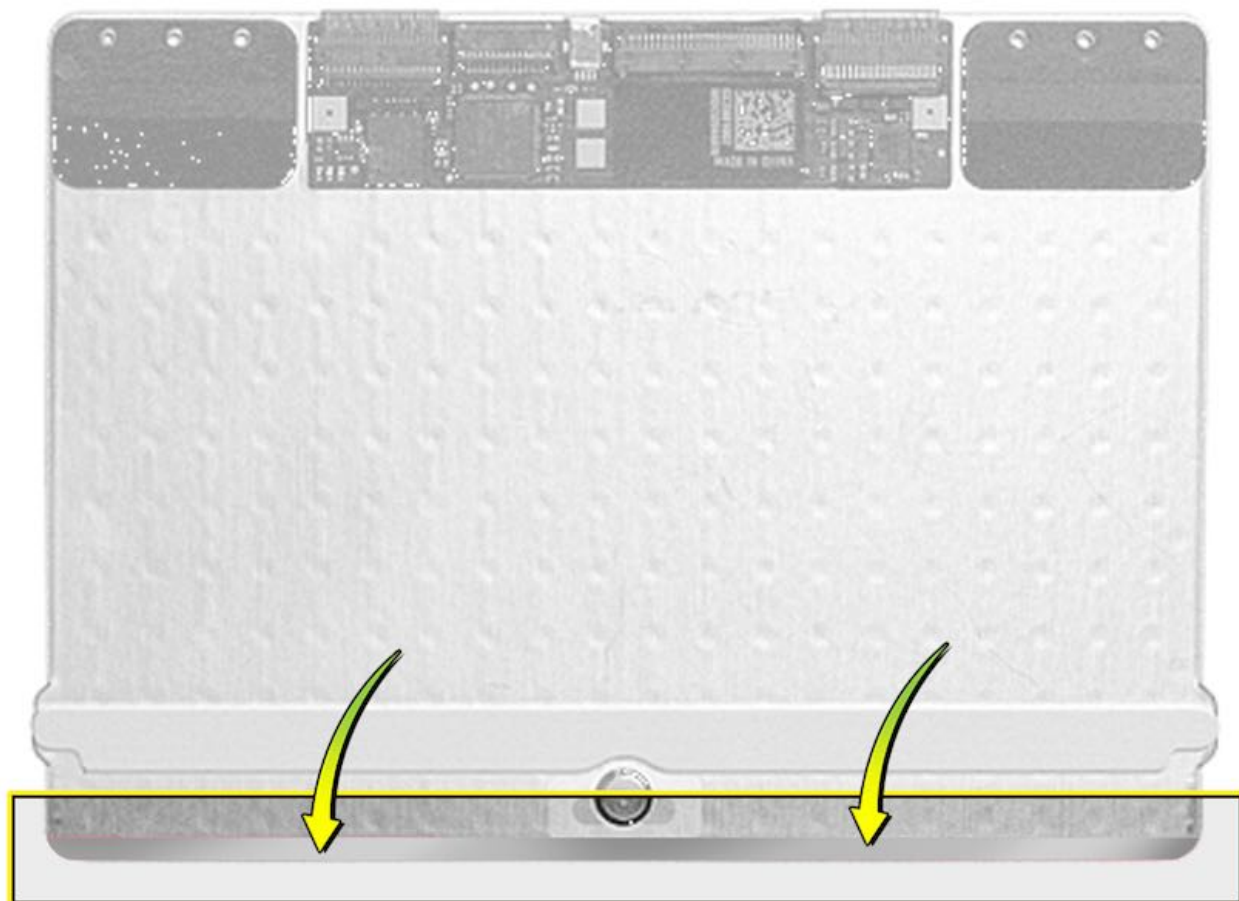
With the first steps completed, top case is the remaining part. It includes microphone.



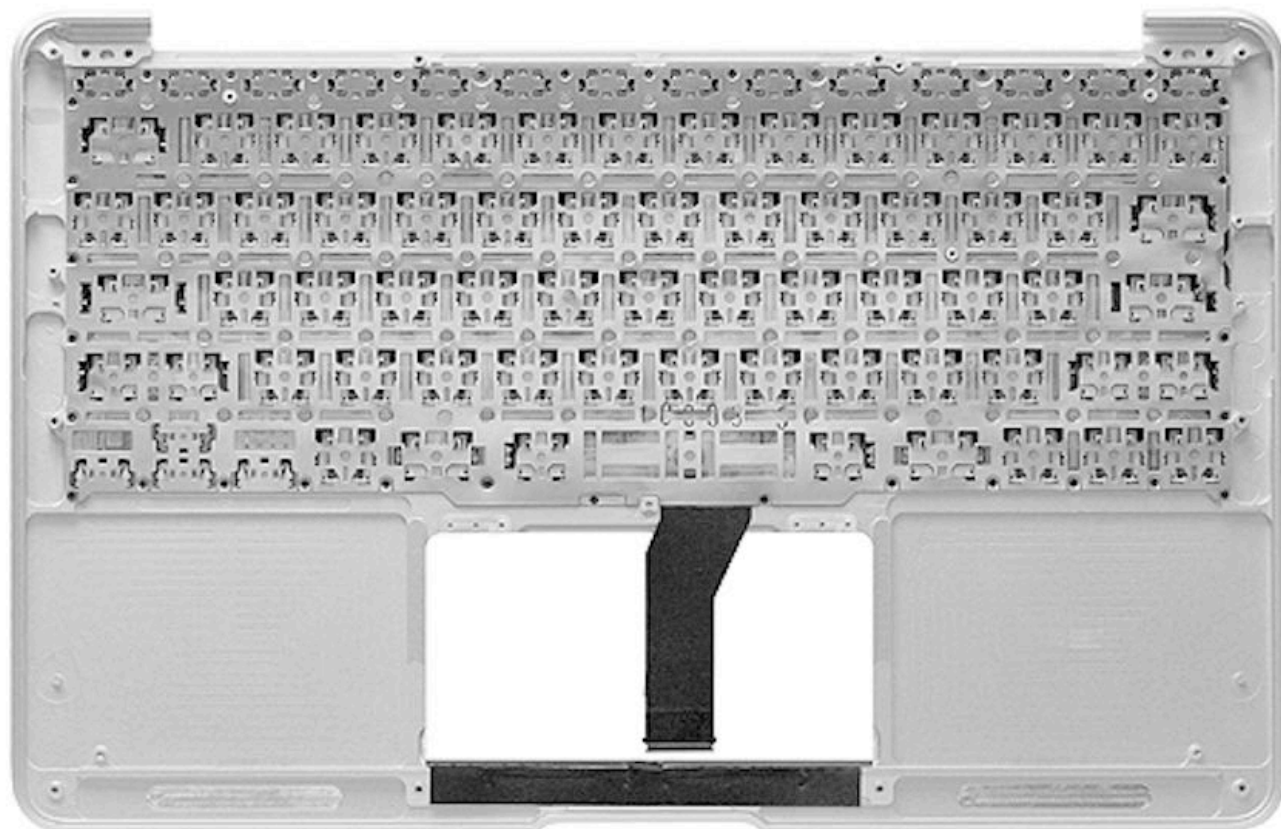
Steps For Reassembly



CAUTION: Be careful not to scratch exposed silver ink on lower edge of trackpad when installing trackpad into top case. Such scratches create black spots on trackpad, which are visible to user.

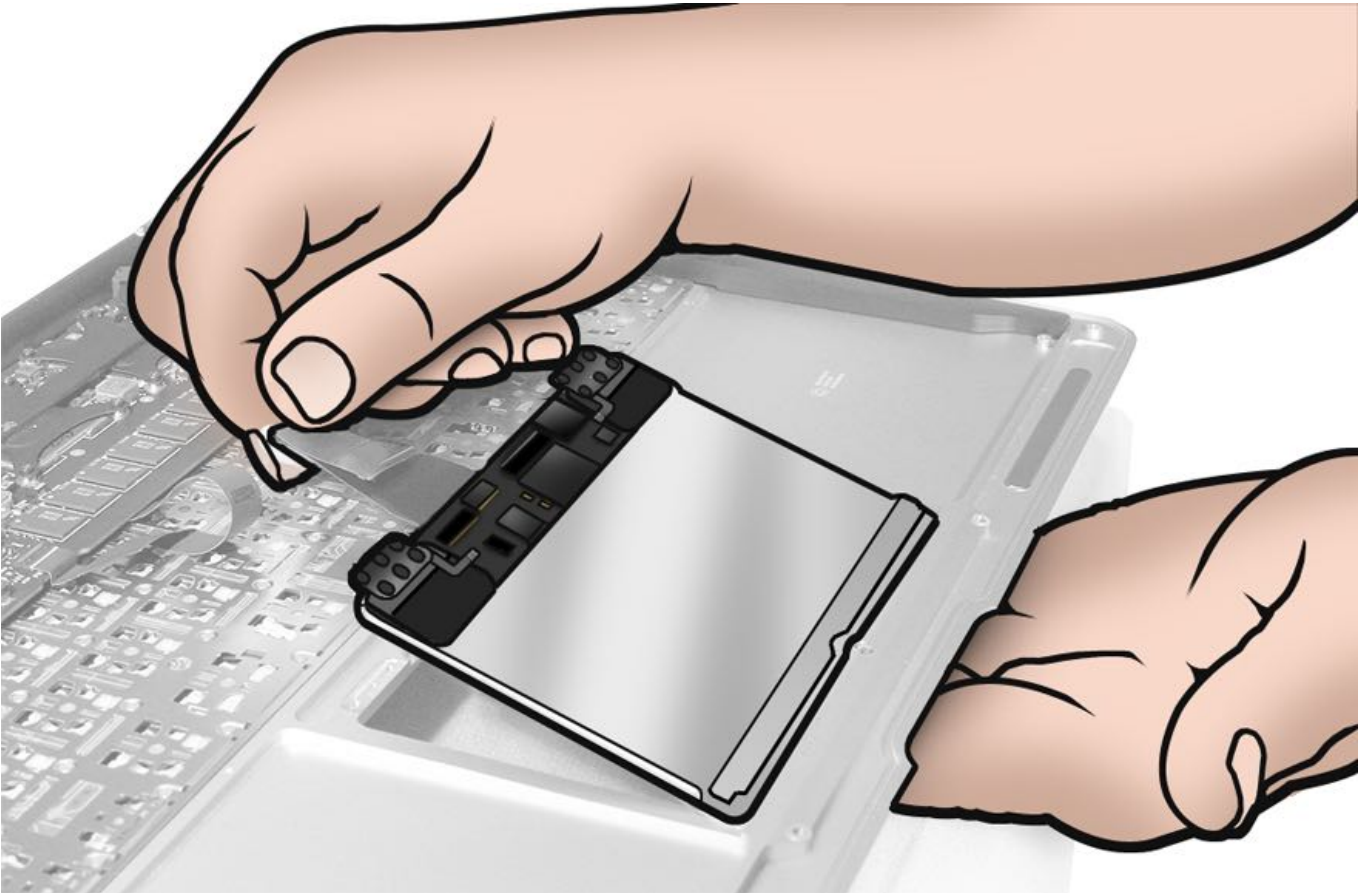


1. Replacement top case has a mylar strip along lower edge of trackpad opening to protect exposed trackpad ink.

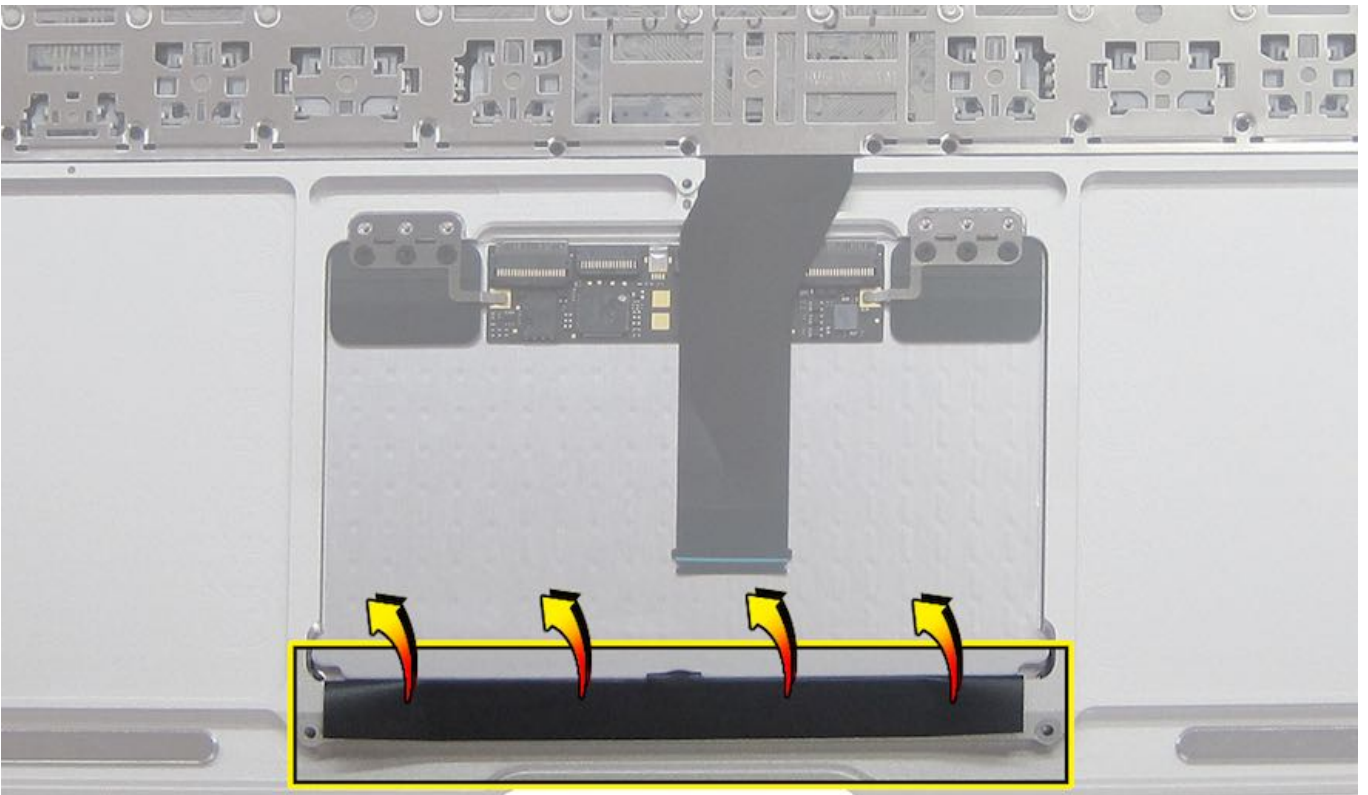


2. Carefully slide trackpad — lower edge first — into top case, until trackpad seats inside opening.

Caution: Minimize rubbing edges of trackpad against top case while installing. Friction could cause tiny cracks to form on trackpad.



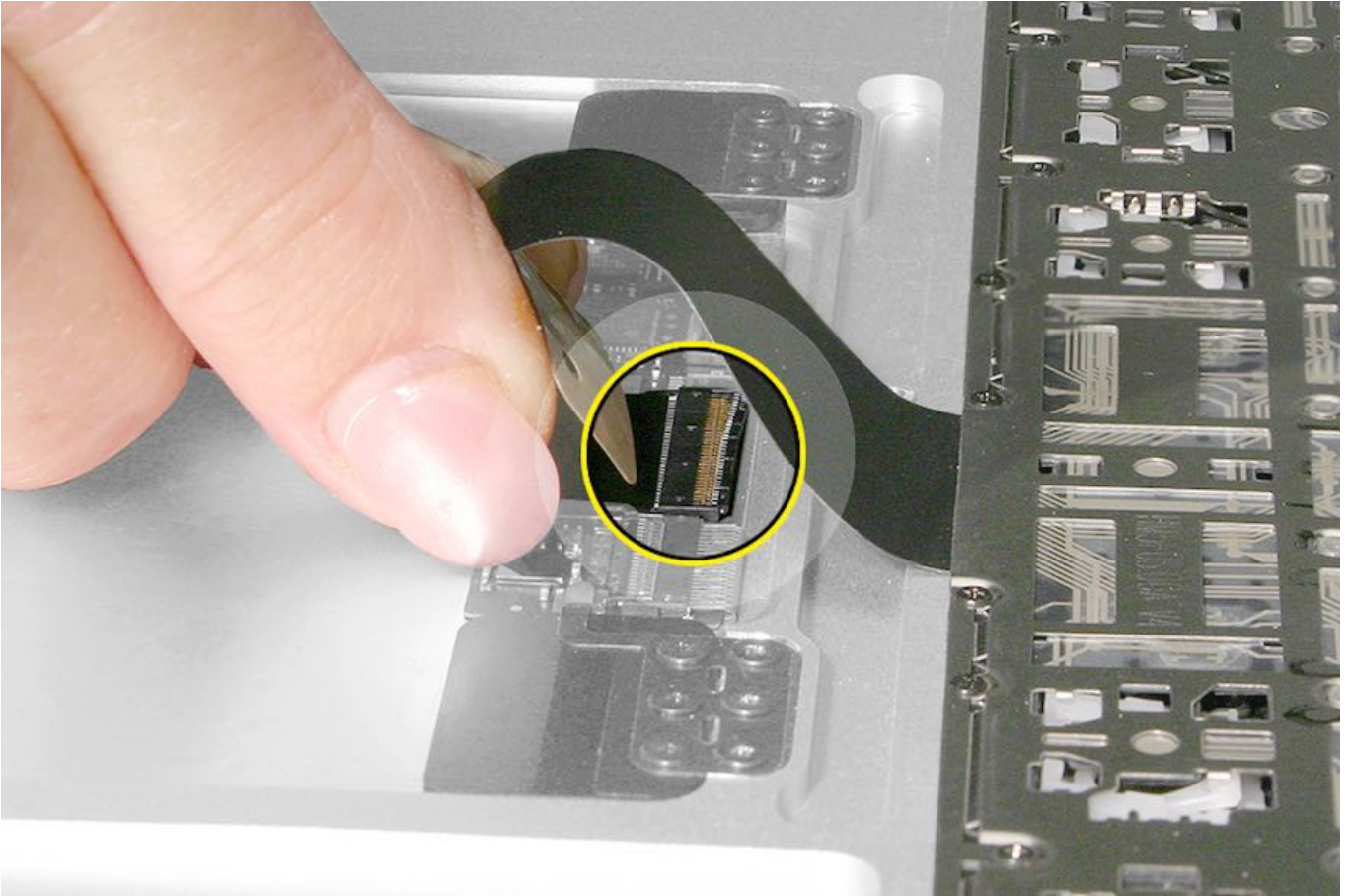
3. Remove mylar, including any pieces that might be caught between trackpad and top case.



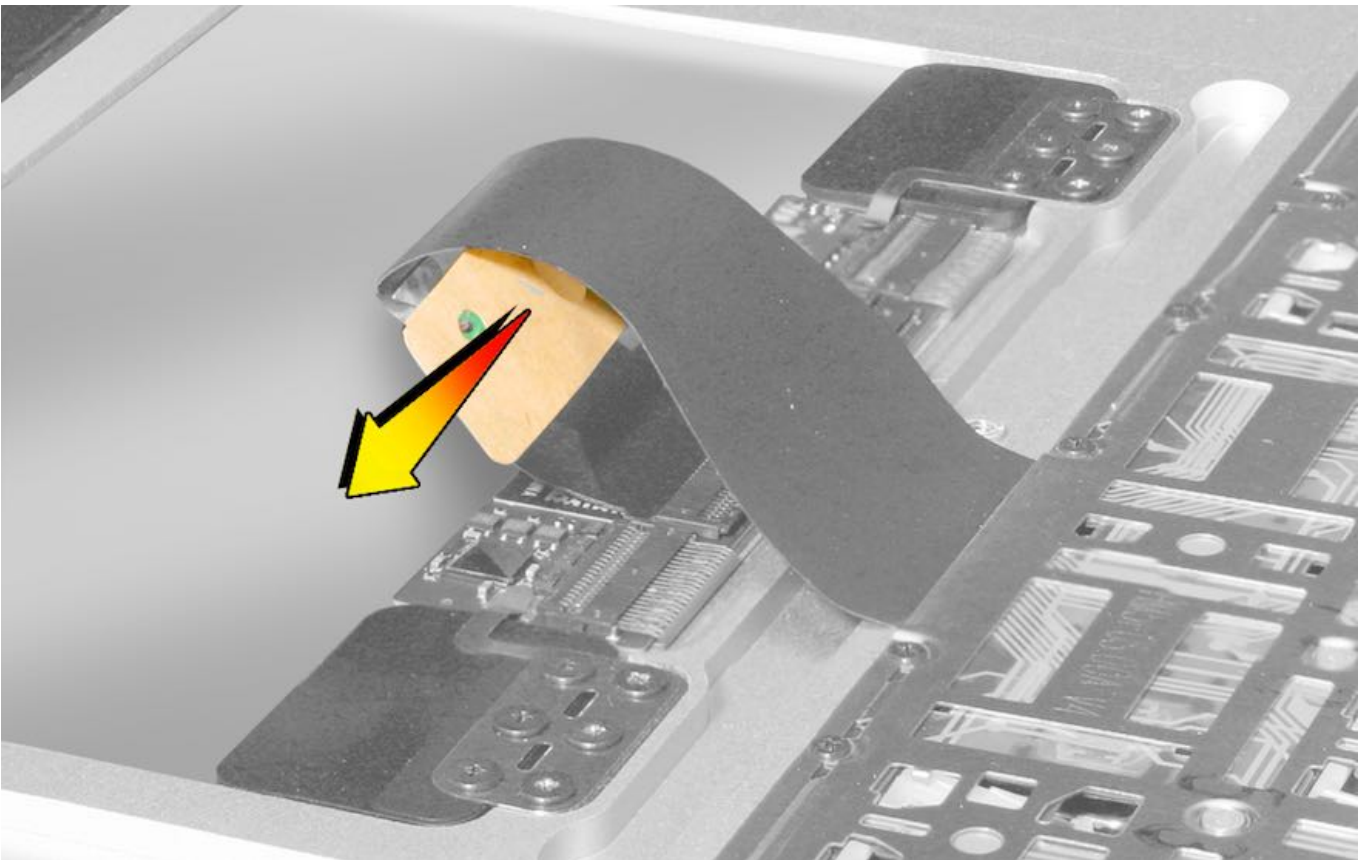
4. Insert keyboard cable into trackpad connector.

5. Flip trackpad locking lever toward logic board.

Note: If cable is already folded and sealed with very high bond (VHB) adhesive, skip steps 6 and 7.



6. Peel adhesive backing from keyboard cable to expose VHB.



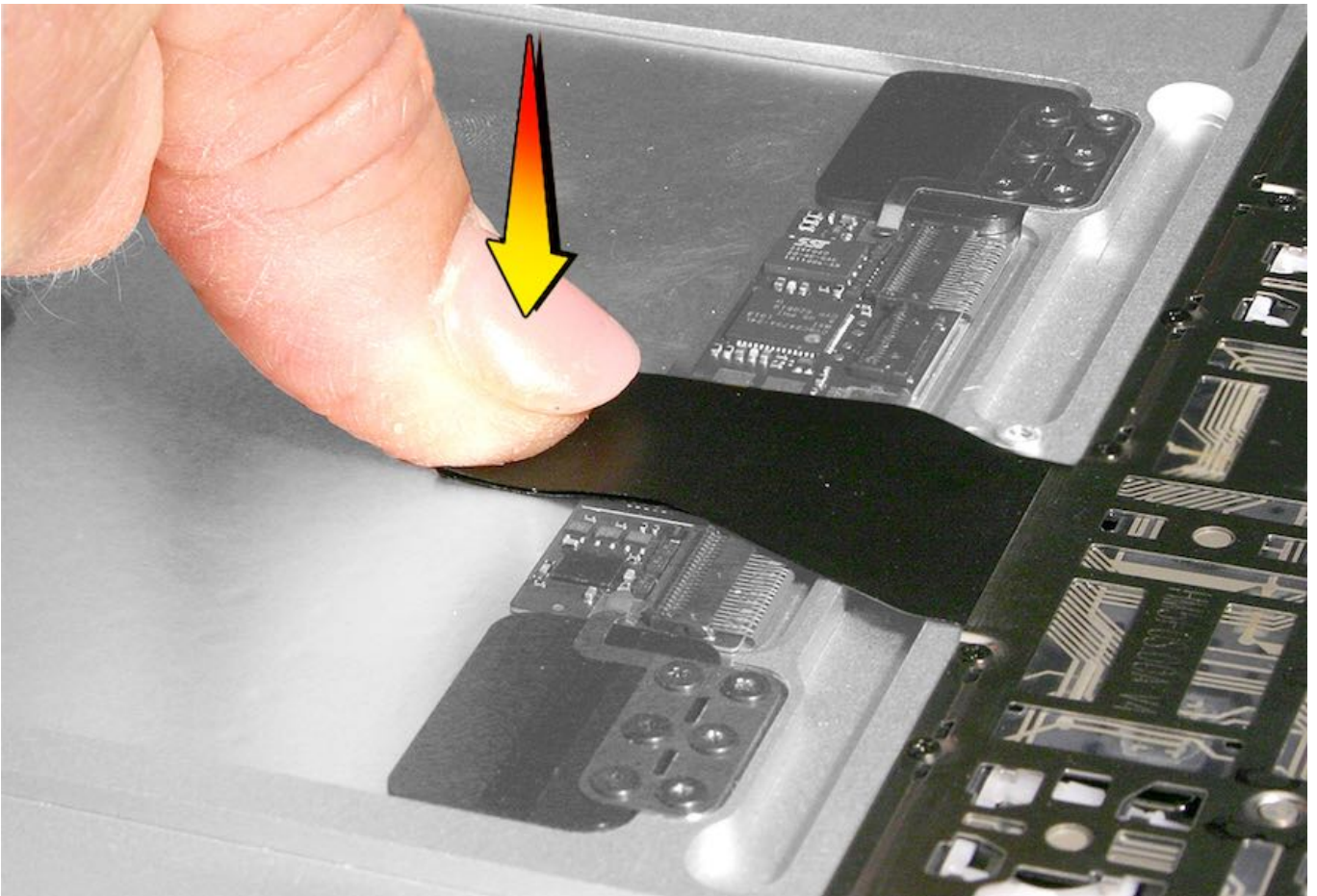
7. Press down firmly on keyboard cable for 15 seconds to:

- Flatten cable.
- Adhere VHB to upper and lower surfaces of cable.

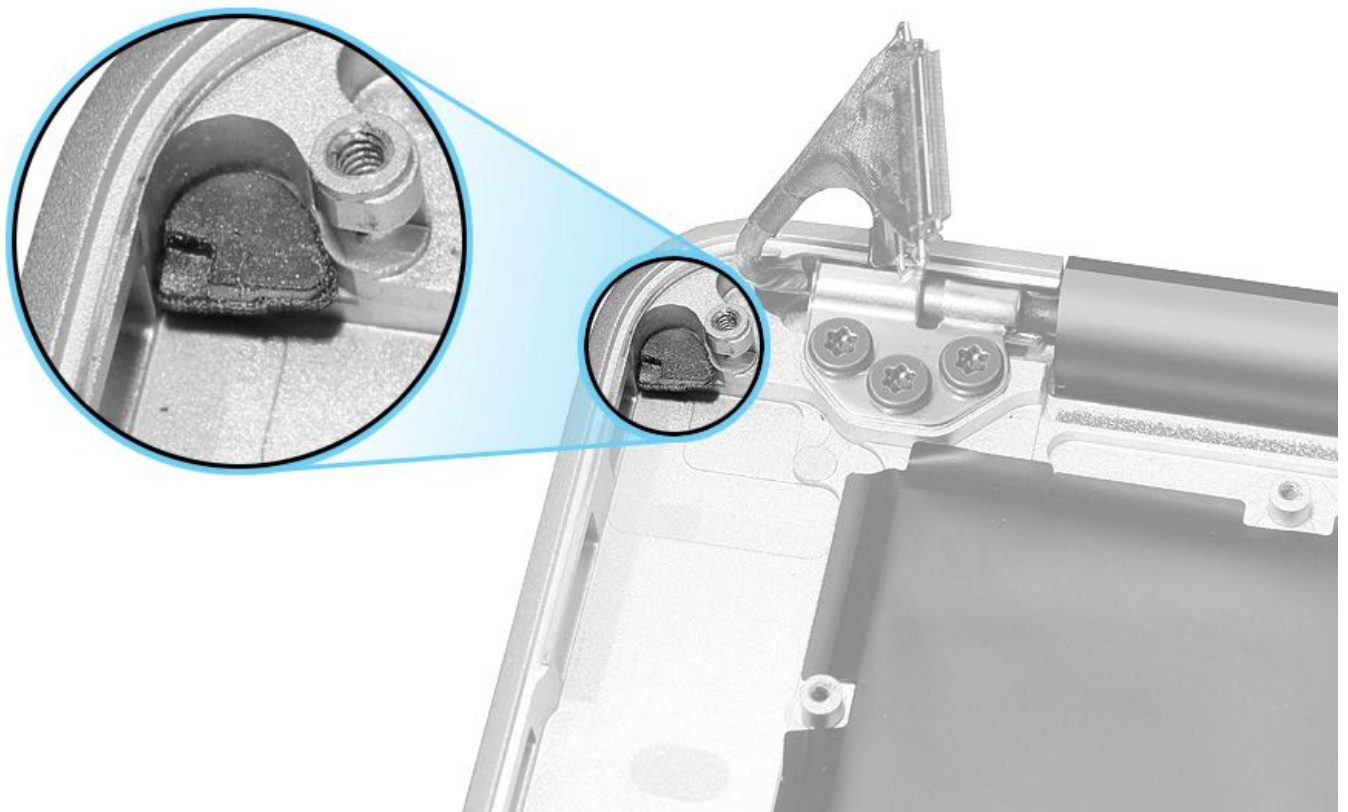
Caution: Keyboard cable MUST lie flat against trackpad. VHB adhesive holds the bend in cable. If VHB or cable are

compromised, trackpad alignment issues might occur. This may necessitate top case replacement.

8. Replace trackpad screws. Connect input cable. Align trackpad.



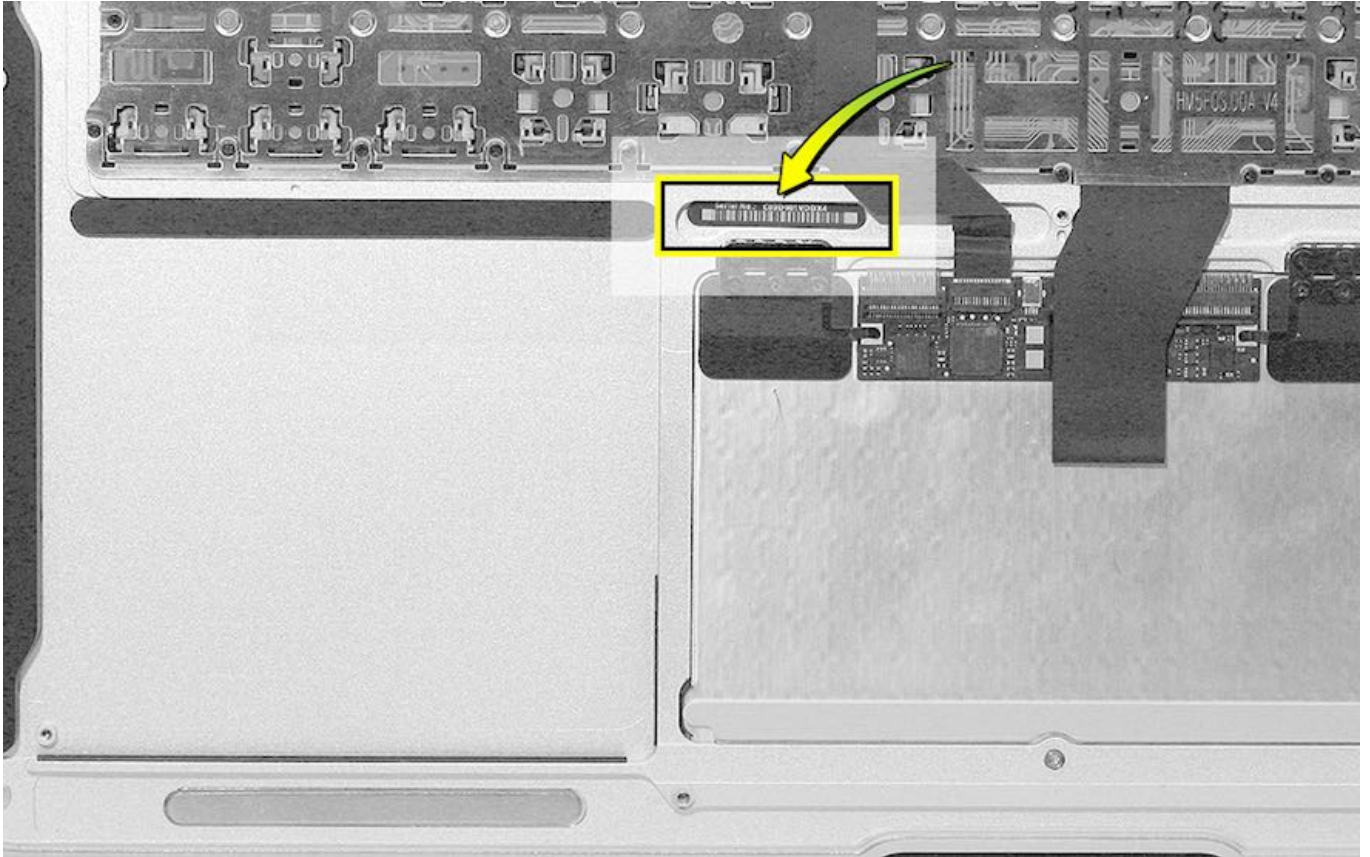
9. Peel off protective film from adhesive on underside of rubber gasket included with top case. Install in position shown.



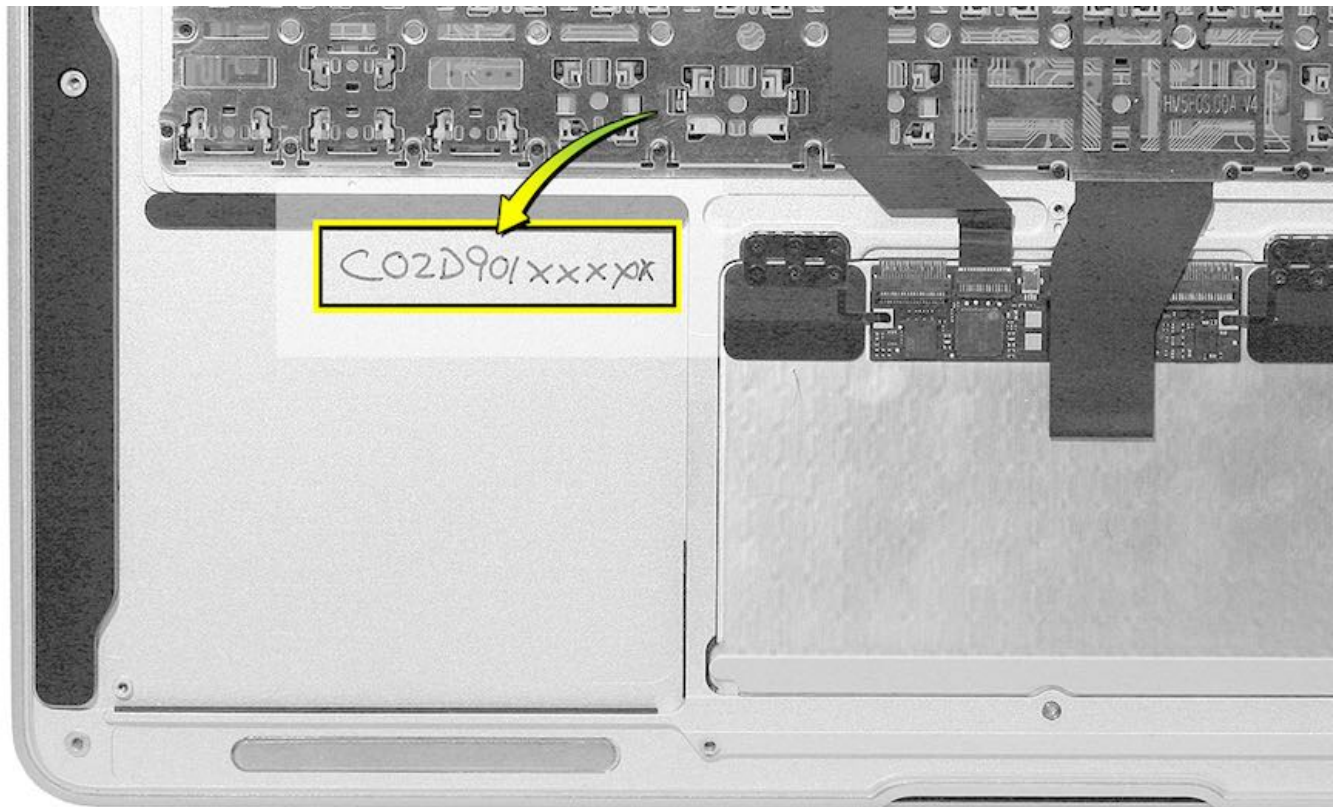
10. When installing replacement top case, retain original top case until repair is complete.

11. Before installing replacement top case, use heat gun and knife to lift up serial number label.

12. Transfer label to inside of replacement top case.



13. If label cannot be reused, use fine-tip permanent marker to write serial number on inside of top case.



14. Install left speaker. Use only a single layer of adhesive.

Important: For left speaker to fit properly in replacement Mid 2011-2014 top case, it is especially important to clean off any adhesive or residual debris from bottom of speaker before installing. Replacement top case comes with adhesive pre-applied in strips to hold left speaker. Adhesive must lie flat in a single layer. Do not double up adhesive.

IMPORTANT: It is recommended you use the [Trackpad Keyboard Mapper](#) after replacing the Mid 2013 or Early 2014 top case. For more information, refer to Apple Support article [TP1016: AST Reference Guide: Using the Trackpad](#)

[Keyboard Mapper.](#)

Apple USB SuperDrive

First Steps

Important: The following procedure is intended only for removing a stuck disc from an Apple USB SuperDrive at the user's request. Do not take apart an Apple USB SuperDrive for repair. The repair strategy for this product is Whole Unit Replacement.

This procedure requires placing SuperDrive upside down on its top case. Always use a clean, debris-free static mat to avoid scratches and other cosmetic damage to the housing.



Tools

- ESD wrist strap and mat
- Black stick (922-5065)
- #000 Phillips screwdriver
- T10 Torx screwdriver (later models)
- Suction cup (922-8252)



Steps For Removal

Because this is a handheld procedure, perform these steps over a workbench or elevated repair surface to minimize height from which a component might fall.

1. Hold SuperDrive securely in one hand by edges of silver top case, with black bottom case facing up and USB cable leading away from you.



2. With other hand, place suction cup on center of bottom case. Press down firmly to flatten and secure suction cup.



3. Once suction cup is fully adhered, lift straight up. Pull bottom case directly out of top case in one smooth motion. Secure fit might give a lot of resistance.

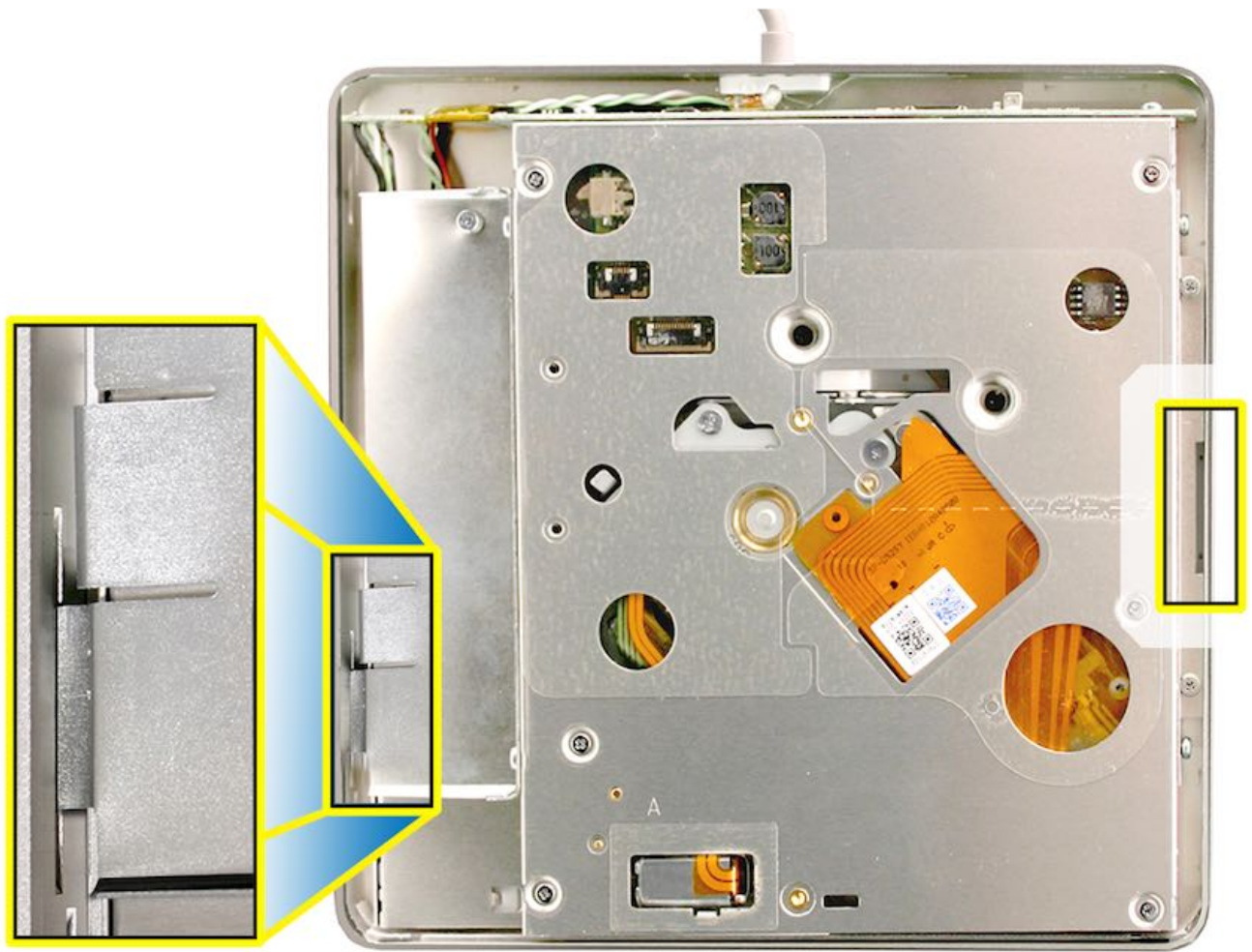
Important: Adhesion of suction cup is short-lived. To avoid damage from dropping, immediately set bottom case on a clean surface. Be mindful of tabs.



4. Set drive top-down on a soft, clean surface, with inside facing up and USB cable leading away from you. Remove three #000 Phillips screws (shown below).



5. Note tab on lower left of drive fits into recessed slit on inside edge of top case (see below left). On opposite side of drive, note gap in center of right edge of drive (see below right).



6. Insert flat edge of black stick into gap on right edge of drive. Carefully pivot edge upward slightly, just enough to slide drive a few millimeters right. Ease left tab out of top case.



7. Note internal cable leading to external USB cable. In earlier model you will see a controller board connected to cable (see inset below).

Caution: Since cable remains connected during this procedure, be careful not to pull or stress cable connections. To avoid

damaging cable, always keep drive within an inch or so of outer case.

8. Grip drive by edges. Avoid touching components. Lift drive up and out of top case a few millimeters — enough to pivot and flip drive over.



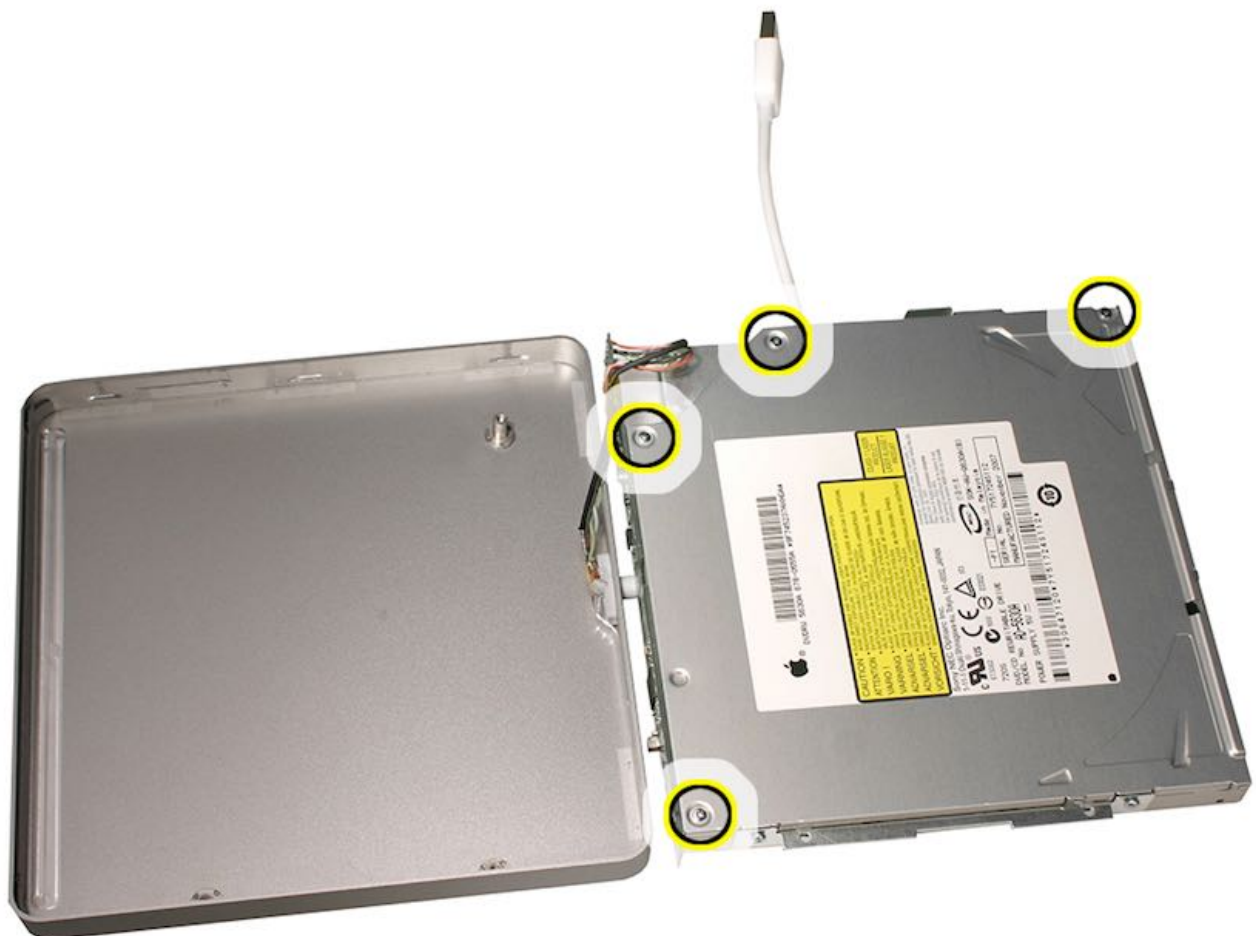
9. As if opening a book, flip drive up and over. Gently lay it down, keeping edges as close together as possible to avoid straining cable connections.



10. Immobilize drive while removing screws or components, holding drive by bracket or edges only.



11. Remove four #000 Phillips screws from top of drive (shown below).



12. Remove two T10 screws or two Phillips screws (depending on model) holding bracket to drive.

Earlier model:



Later models:



13. Lift top lid of drive, pivoting right edge up. Then shift lid left and downward to remove left edge.



14. Remove stuck disc. Reassemble SuperDrive in reverse order of previous steps 4-13. Proceed to step 15 to correctly reinstall bottom case.



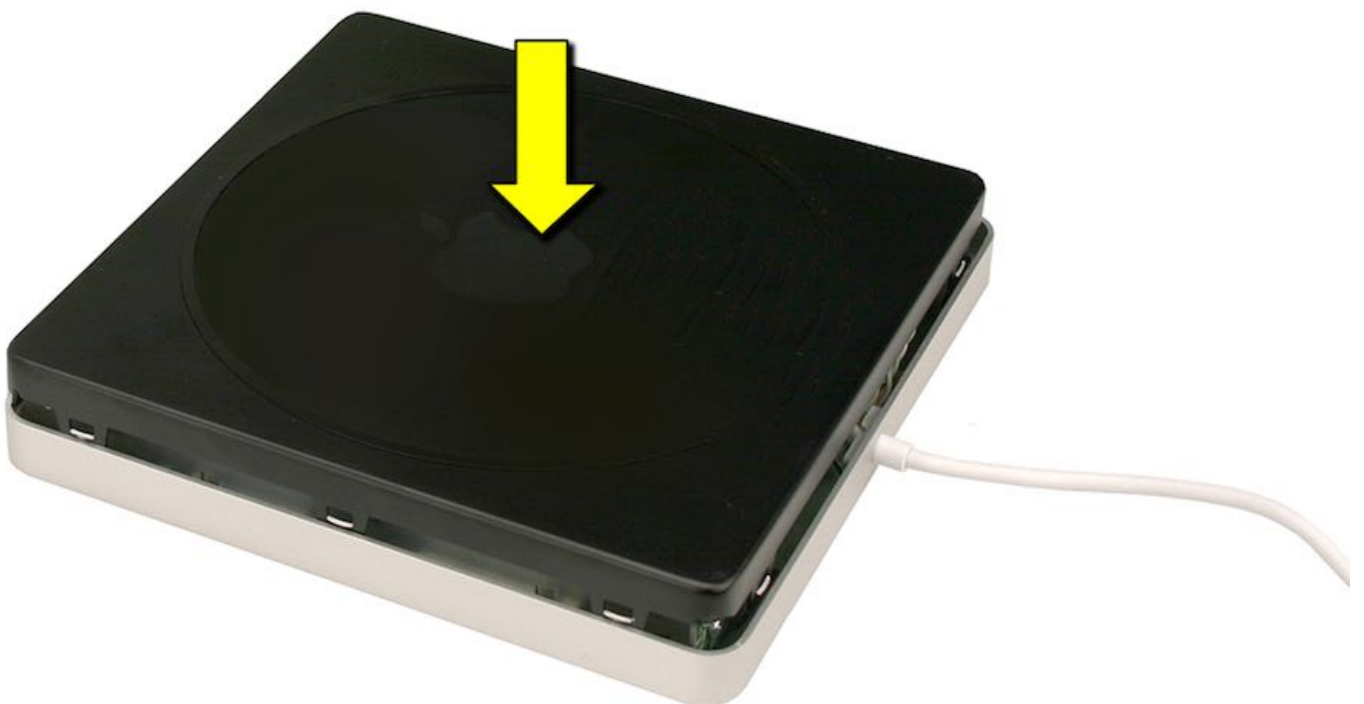
15. Orient bottom case to top case, as pictured below. Note three tabs per side on left and right sides of drive and two corner tabs in back. There are no tabs in front (where disc slot is located).



16. Set bottom case evenly on top case with tabs just inside perimeter of top case edge. Align all tabs with top case.

Note: If case is oriented correctly, Apple logo will be right-side up when USB cable is pointed toward you.

17. With firm, even pressure, snap bottom case into top case to seat tabs. Verify all tabs are fully seated and SuperDrive sits flat.



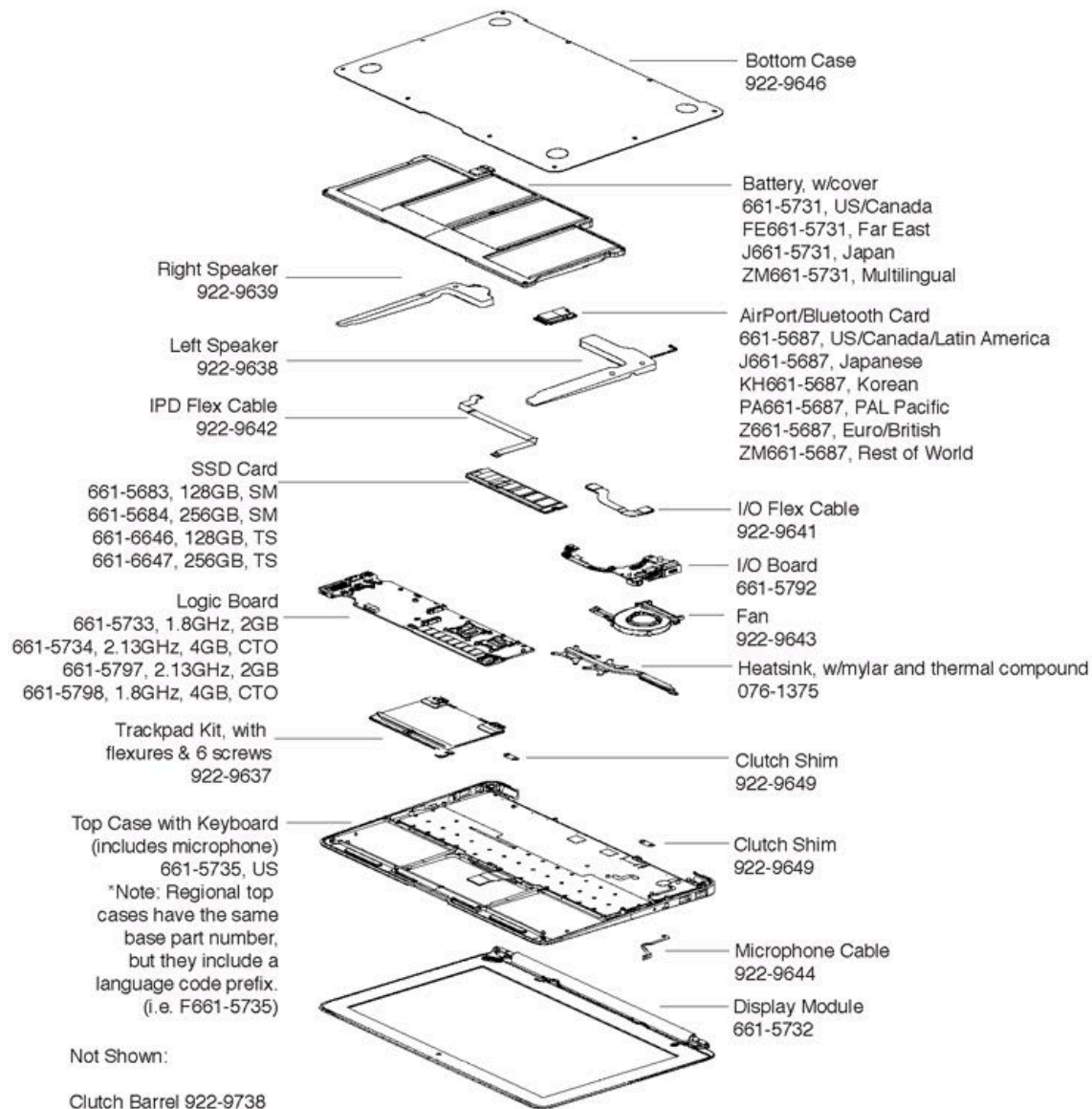
Steps For Reassembly

Reassemble in reverse order of removal steps.

Quick Test

Plug Apple USB SuperDrive into known-good computer to check functionality. Check drive for disc insertion, mounting, and ejection of a variety of optical media.

MacBook Air (13-inch, Late 2010): Exploded View

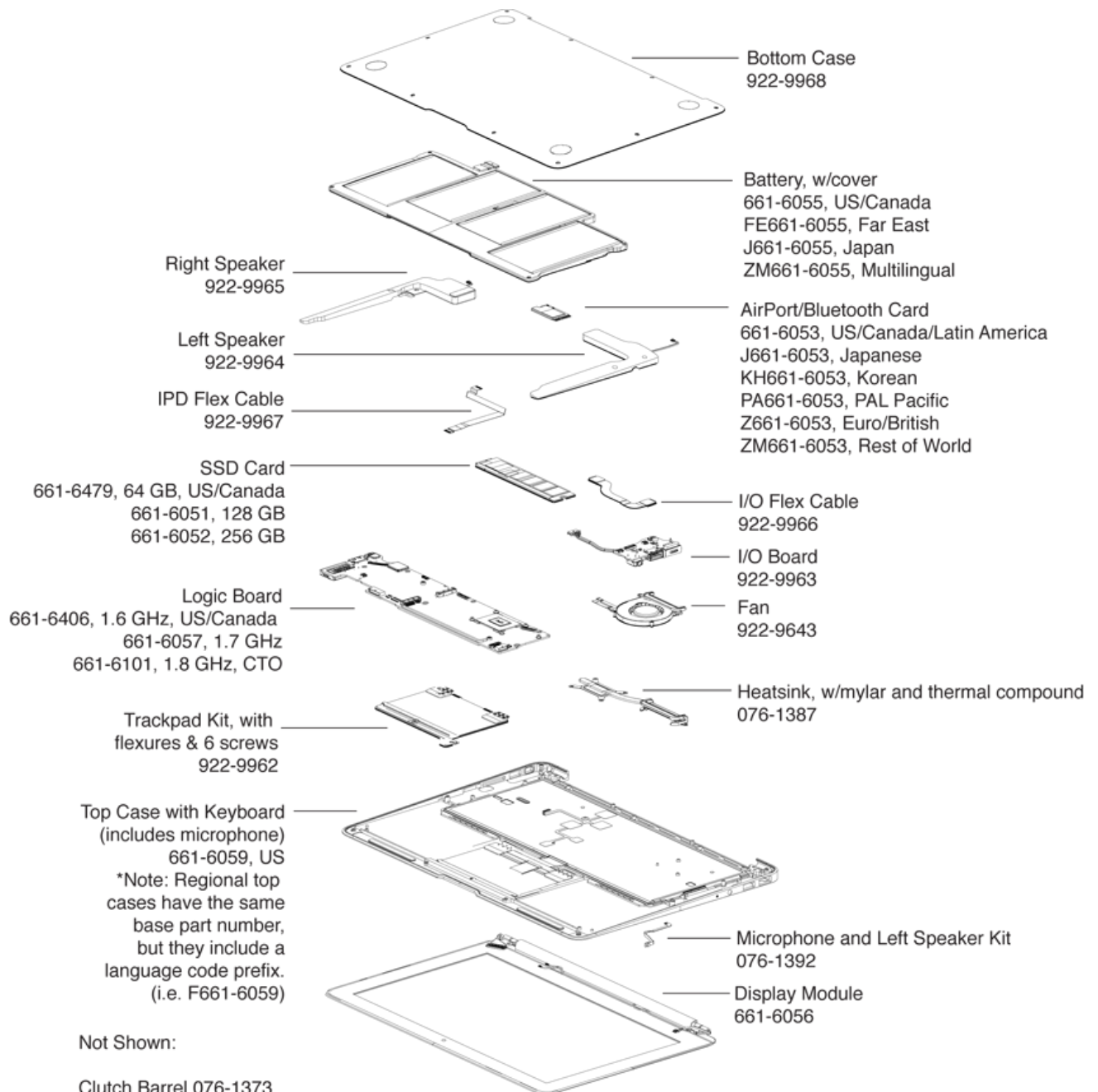


Not Shown:

Clutch Barrel 922-9738
 Battery Cover 922-9735
 Thermal Compound, Syringe 922-7144
 Power Adapter, 45W 661-5730, PA661-5730, PAL Pacific

Superdrive, External 661-5677 (see note on Top Case, Re: regional parts)








MacBook Air (13-inch, Mid 2011): Exploded View



Clutch Barrel 076-1373
 Battery Cover 922-9735
 Thermal Compound, Syringe 922-7144
 Power Adapter, 45W 661-6054, PA661-6054, PAL Pacific

Superdrive, External 661-5677 (see note on Top Case, Re: regional parts)

MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Screw Chart

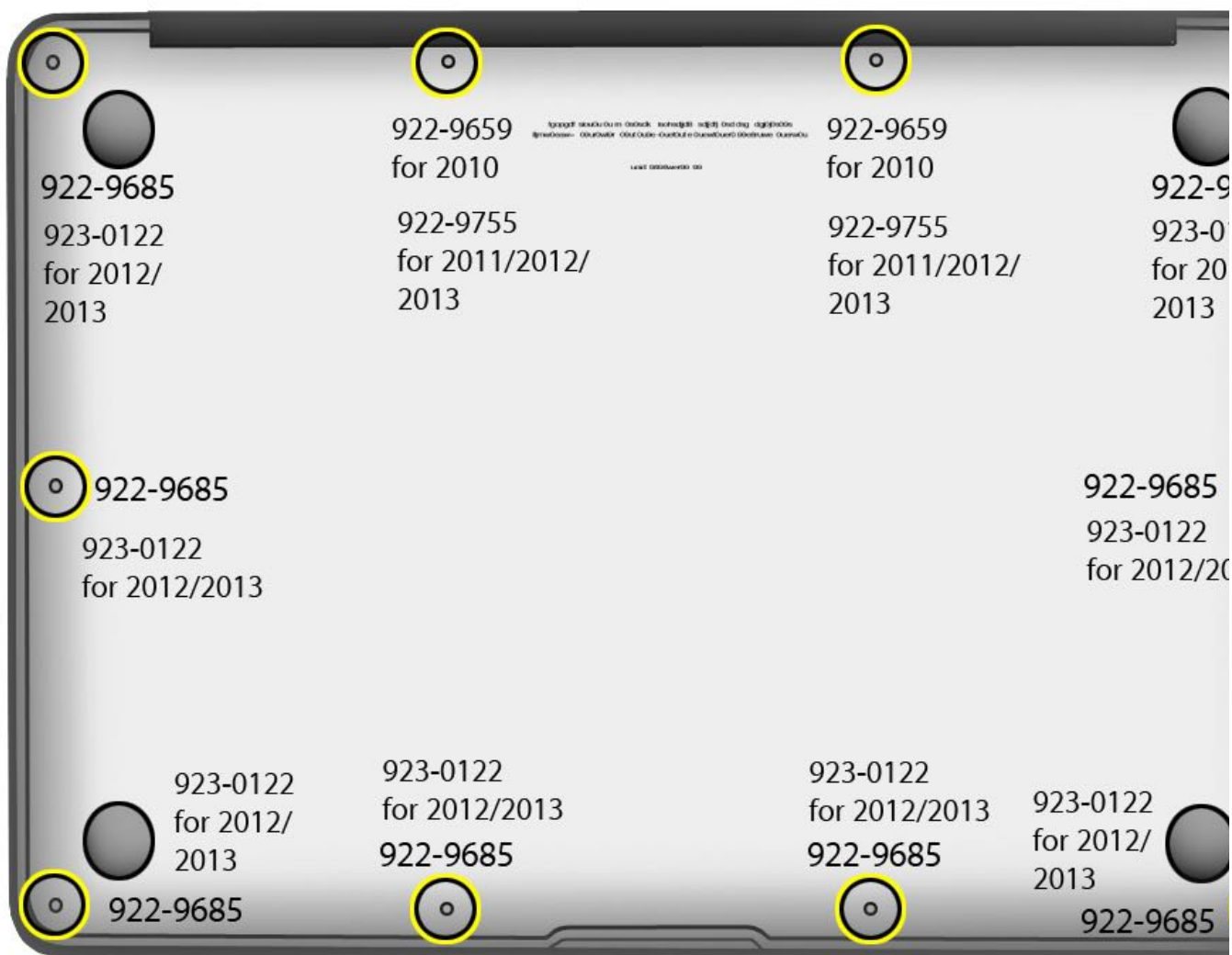
922-9651 Torx T5  Solid State Drive (SSD) (1) AirPort/Bluetooth Card (1)	922-9652 Torx T8  Display Clutch Hinge (6)	922-9653 Torx T5  Heat Sink Late 2010 (8) 2011-2014 (4)
922-9654 Torx T5  Battery Late 2010 (top, center) (3) 2011-2014 (center) (1)	922-9655 Torx T5  Heat Sink to Top Case (1) Late 2010, Mid 2013, Early 2014: Battery (2)	922-9656 Torx T5  Logic Board(6) I/O Board (1)
922-9657 Torx T5  Fan (under I/O cable) (1) Mid 2011/2012: Battery (2)	922-9658 Phillips #000  Trackpad flexure (6)	922-9659 Pentalobe  Late 2010: Bottom Case (2)
922-9660 Torx T5  Fan to Logic Board (1) (Late 2010): Speakers (1)	922-9661 Torx T5  Fan to I/O Board (1)	922-9685 Pentalobe  Late 2010/Mid 2011: Bottom Case (8)

922-9732 Torx T5  Trackpad (set screw) (1)	922-9755 Pentalobe  2011-2014: Bottom Case (2)	922-9969 Torx T5  2011-2014: Battery (top sides) (2)
923-0122 Pentalobe  2012-2014: Bottom Case (8)		

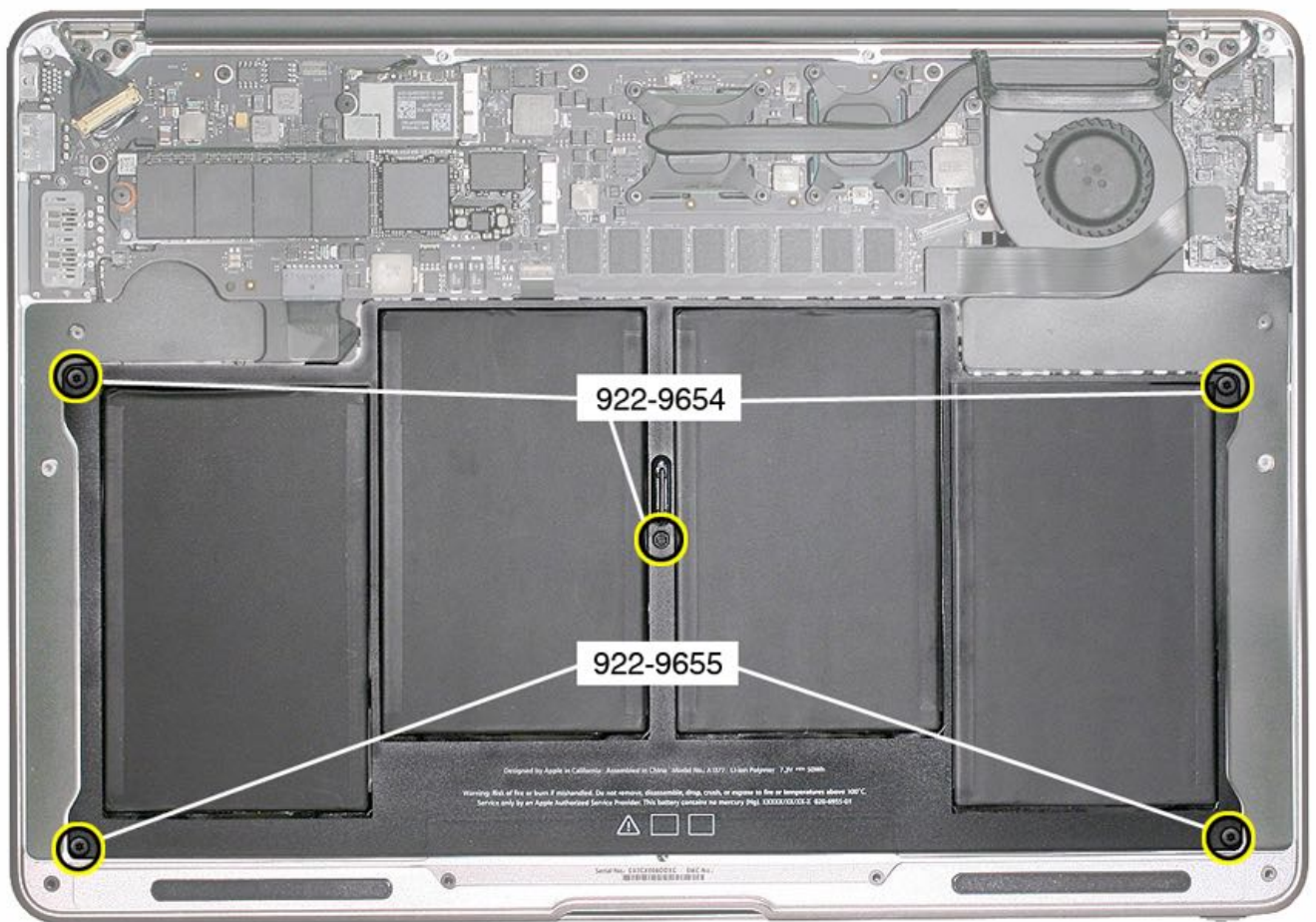
MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): Screw Location Diagrams

Bottom Case

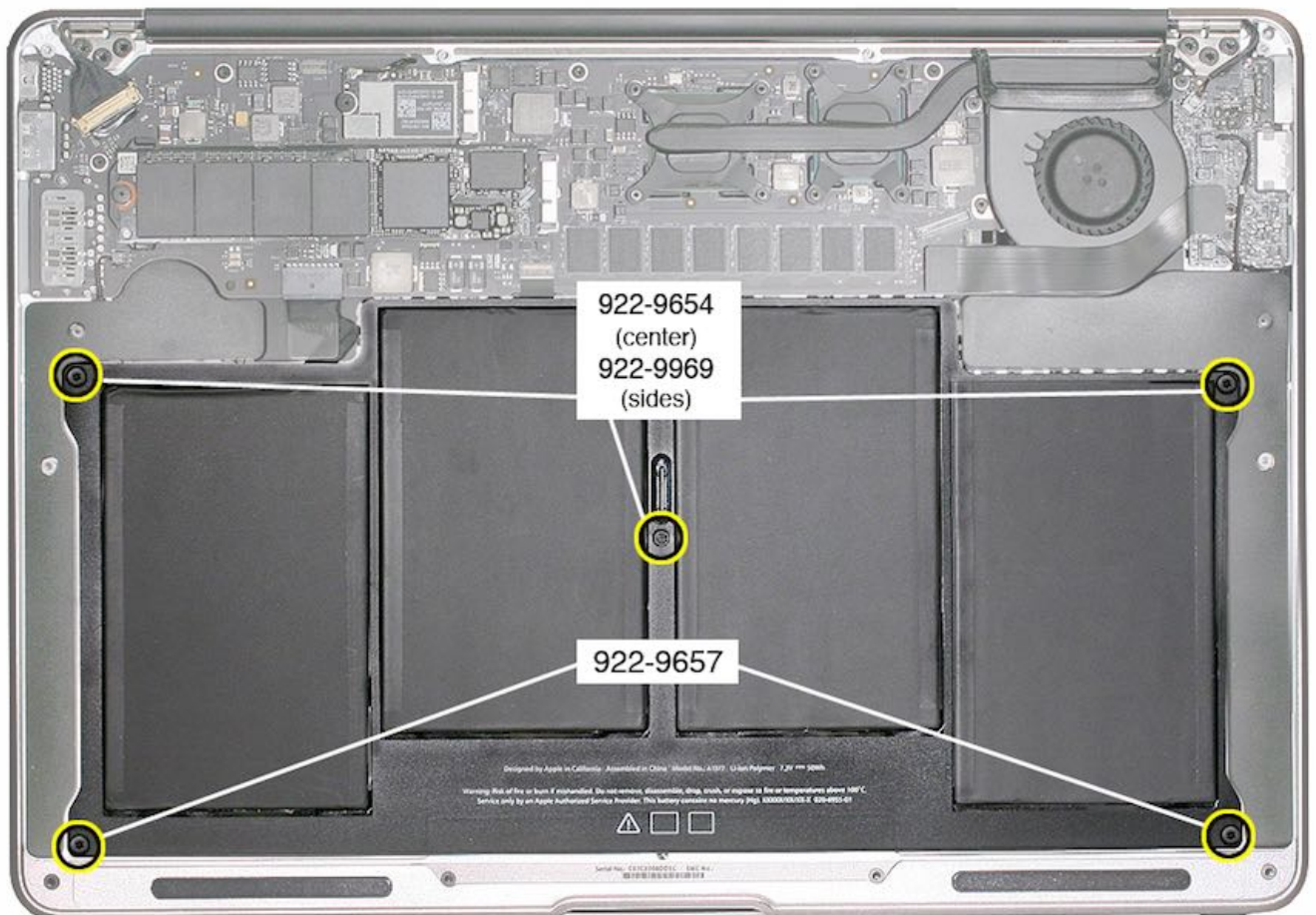
Note: Every screw labeled for 2013 also applies to the Early 2014 model.



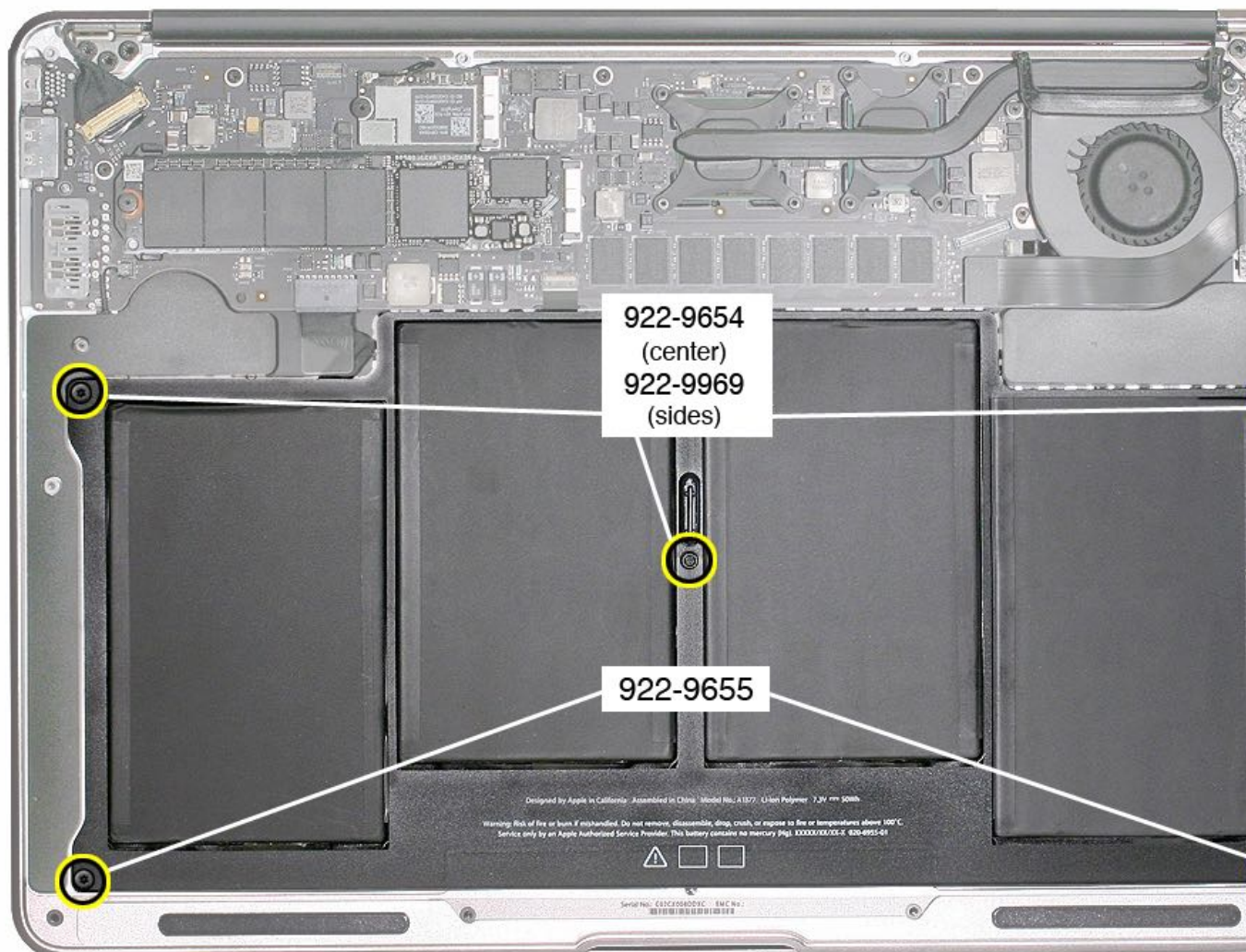
Battery, Late 2010



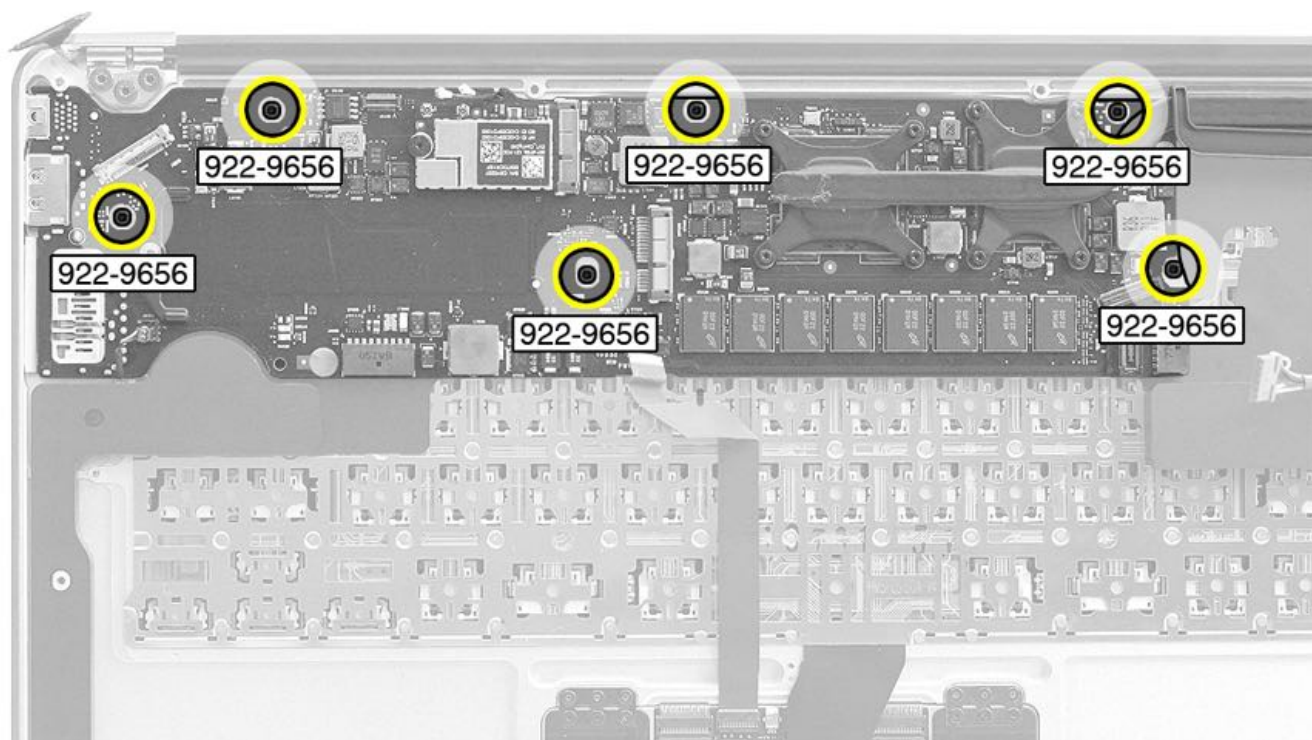
Battery, Mid 2011 and Mid 2012



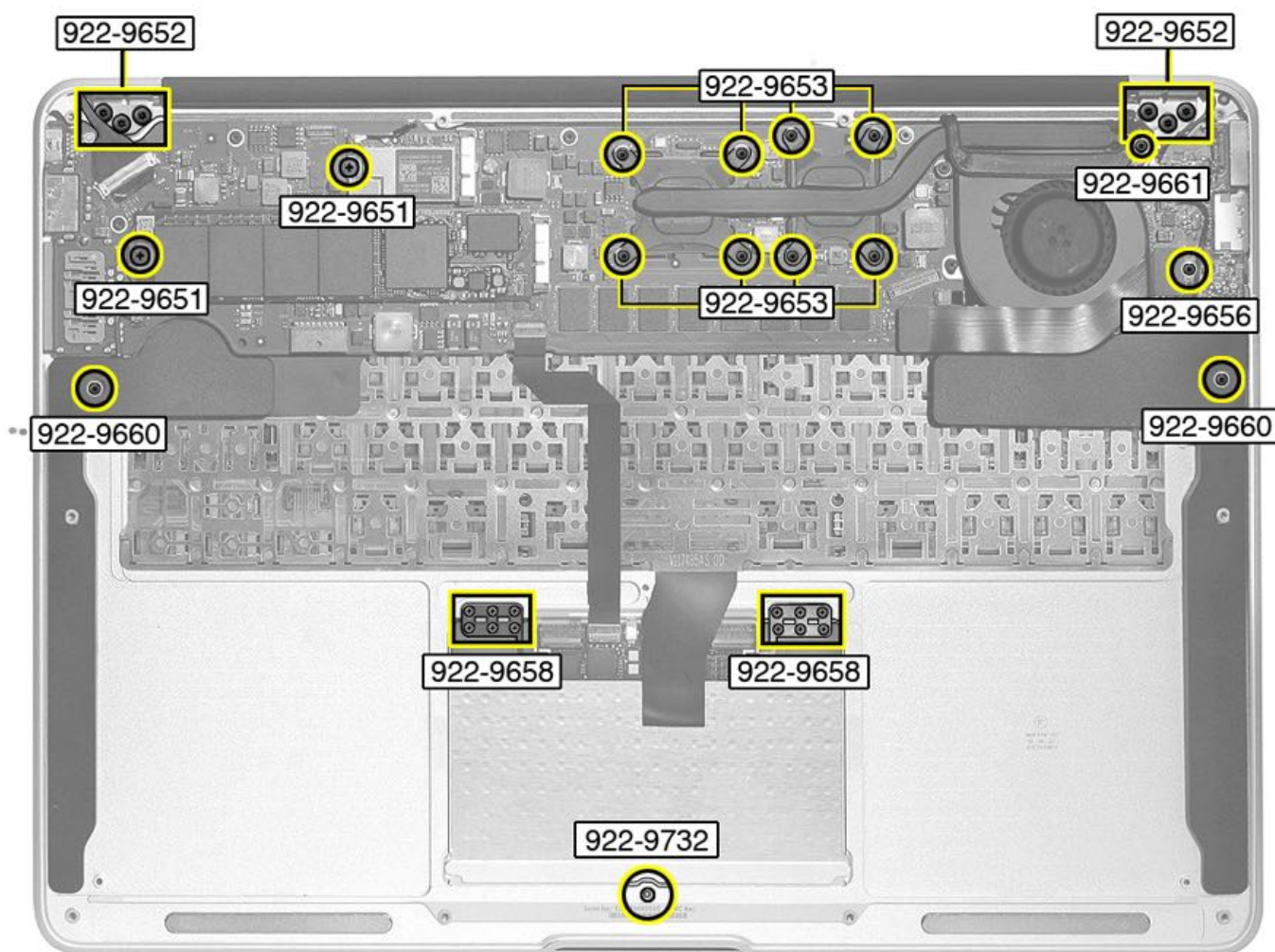
Battery, Mid 2013 and Early 2014



Logic Board



Speakers, I/O Board, Display Clamshell, Heat Sink, SSD Card or Flash Storage, AirPort/Bluetooth Card, Trackpad



MacBook Air (13-inch, Late 2010, Mid 2011, Mid 2012, Mid 2013, Early 2014): External Views

Front View



Port View

Late 2010, Mid 2011, Mid 2012



Mid 2013 and Early 2014



Late 2010



Mid 2011, Mid 2012, Mid 2013, Early 2014



A = MagSafe (Late 2010 and Mid 2011) or MagSafe 2 (Mid 2012, Mid 2013, Early 2014)

B = USB 2.0 (Late 2010 and Mid 2011) or USB 3 (Mid 2012, Mid 2013, Early 2014)

C = Headphone (audio out)

D = Microphone

E = SD Card Slot

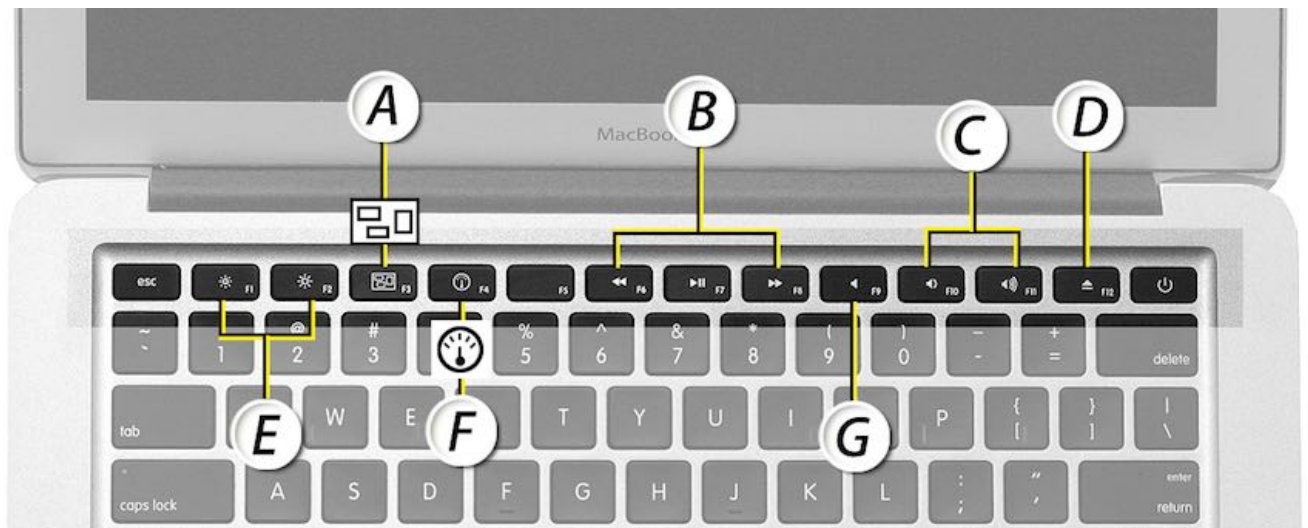
F = USB 2.0 (Late 2010 and Mid 2011) or USB 3 (Mid 2012, Mid 2013, Early 2014)

G = Mini DisplayPort (Late 2010) or Thunderbolt (Mid 2011, Mid 2012, Mid 2013, Early 2014)*

* The Thunderbolt port connects Thunderbolt-compatible devices for high-speed data transfer or an external display that uses Thunderbolt or Mini DisplayPort.

Function Keys

Late 2010



A = Exposé key

B = Media keys

C = Volume keys

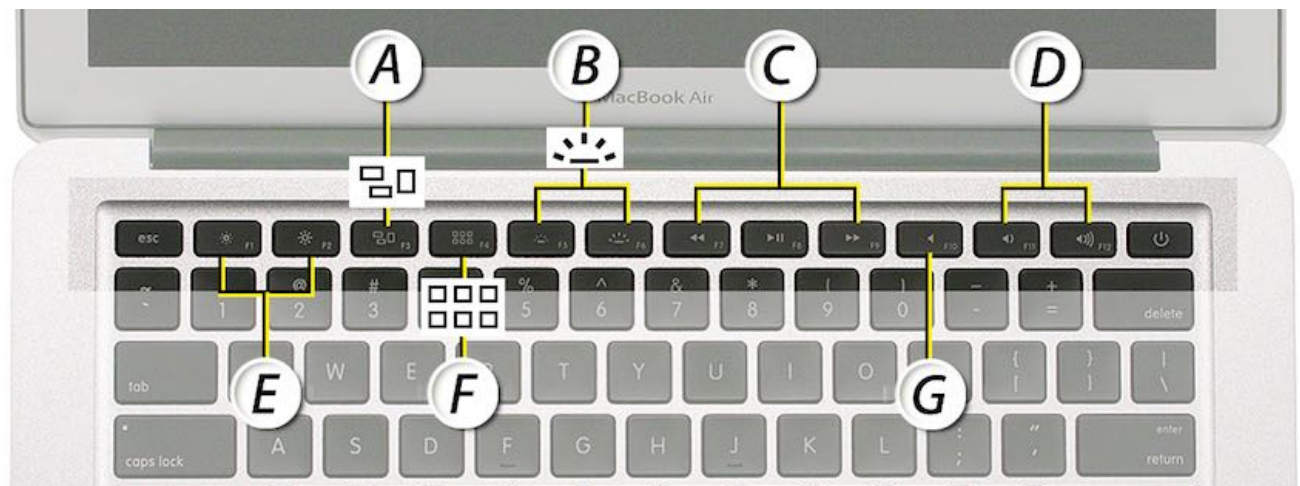
D = Media Eject key

E = Brightness keys

F = Dashboard key

G = Mute key

Mid 2011, Mid 2012, Mid 2013, Early 2014



A = Mission Control key

B = Keyboard illumination keys

C = Media keys

D = Volume keys

E = Brightness keys

F = Launchpad key

G = Mute key

Service Guide Feedback

This escalation path is intended only for content issues with Service Guide articles that begin with the prefix IT, RP, SD, SM, SV, or TP.

Please provide a clear and concise description of the content issue you encountered and steps to reproduce. Other information that helps us help you:

- Article Number(s)
- Serial Number(s)
- screenshots or screen recording

For issues with article content, email the **AppleCare Service Documentation** team at **serviceguides@group.apple.com**.

For issues with video content or playback, email the **AppleCare Media Production** team at **servicevideos@group.apple.com**.

Note: You may not receive a response, but all comments will be reviewed and investigated as needed.